ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

GRAW-HILL CO.
CALIFORNIA

JANUARY, 1941

25c a Copy

TIME-SAVING?
MADAM, IT'S AS TIME-SAVING AS YOUR ELECTRIC RANGE!
Electric Cooking Saves Hours of Work
SOUTHERN CALIFORNIA EDISON COMPANY LTD.
Now CHANGE TO MODERN Electric COOKING
BEFORE YOU BUY COMPARE
THE OPPORTUNITIES OF A YULE-TIME
A BEAUTY AND A BARGAIN!
WESTINGHOUSE DE LUXE ROASTER
SEE THEM AT YOUR DEALER OR EDISON OFFICE

It's going to be an electrifying year in Edison territory! Edison advertising, more complete and comprehensive than ever before, will reach an estimated 1,500,000 people every month. Every electrical dealer in every town in Edison territory will receive the selling support of sales-producing newspaper and magazine advertisements, hard-hitting direct mail campaigns, billboards and other forms of appliance promotion. More than 250 newspapers and periodicals will be used to stimulate buying interest to new heights.

Publisher's binding
MAR 12 1942

SOUTHERN CALIFORNIA Edison

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), January, 1941. Vol. 86, No. 1. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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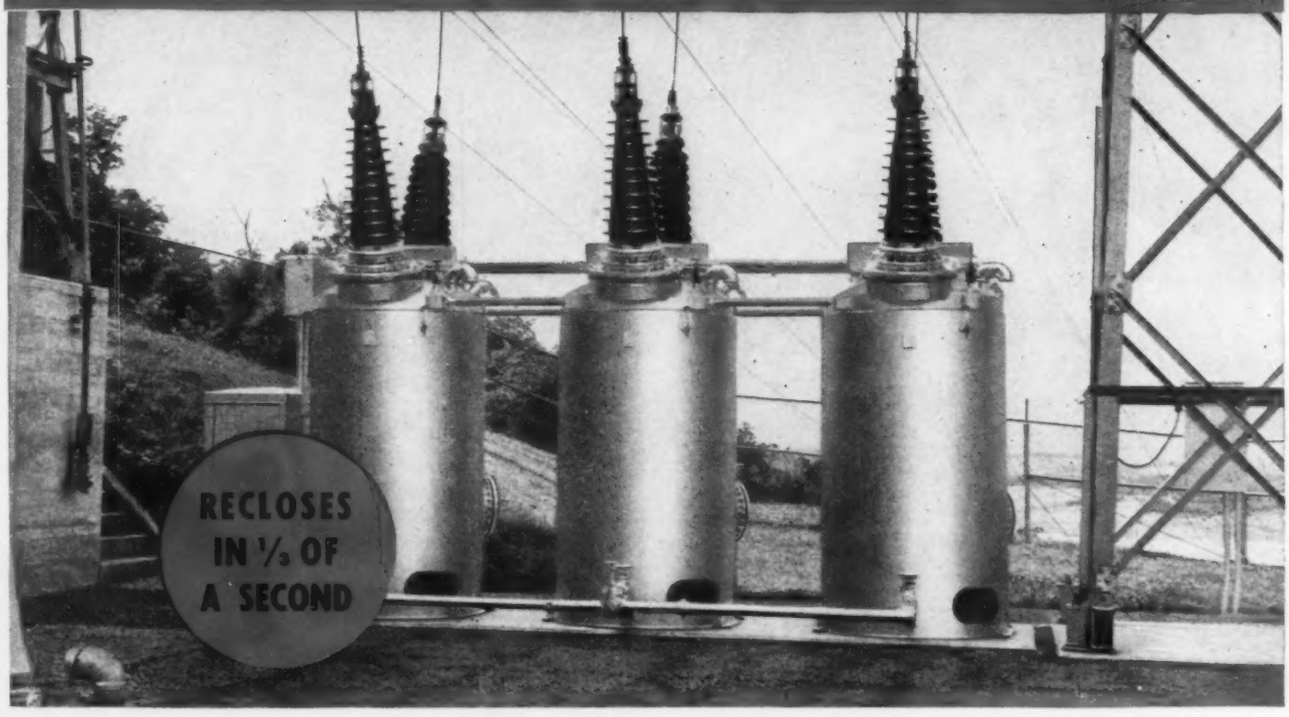
SUPER-SPEED RECLOSING



. . . Already Proved by 60 Breaker-Years of Experience with G-E Installations

SUPER-SPEED reclosing of your large oil circuit breakers is of greater importance today than ever before. The heavy schedules of increased industrial production make it necessary for you to provide the best possible service continuity. That means *super-speed* reclosing.

Fortunately, we are well prepared to meet today's requirements. Recognizing the need for *super-speed* reclosing, our engineers made the first application of a high-voltage, outdoor oil circuit breaker with a super-speed reclosing mechanism five years ago and proved its practicability by successful field tests. This breaker, a Type FHKO-339, operating on a 138-kv, 60-cycle circuit, recloses within 20 cycles (⅓ second) after energizing of the trip coil to start the open-close operation.

G-E breakers with this *super-speed* reclosing mechanism have established an enviable service record. Already sixty breaker-years of experience have been accumulated, demonstrating clearly the reliability of this type of equipment.

We recognize the fact that developments of this kind—which anticipate your operating requirements—are made possible only through the cooperation of your executives, engineers, and operating men. We urge you, in the interest of progress which contributes greatly to the quality of your own service, to consult with our engineers when you are studying circuit breaker problems. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

859-1

Here in the WEST

People

H. V. Strandberg

(his first name is Herbert) is senior engineer, electrical, for the Engineering Division, Seattle Department of Lighting. In 1926 he received his BS from the Univ. of Washington, and has been employed continuously since then by the City.

His field has been high-tension transmission, and he was in charge of design and construction of the City's recently completed 220-kv., 120-mi., double circuit line to Skagit.

His article (p. 32) is the result of a presentation to

the Seattle Section, AIEE. His engineering is carried even to the basement of his home, where, in a snappy workshop, he makes furniture and what not. His recreation is mountain climbing—his favorite terrain the Skagit River region of the Cascades.

F. W. Hutchinson

who so expertly discusses radiant heating, has been a consultant on heating, ventilating and air conditioning since 1936. A Californian, he is a graduate of Cal Tech., with an M.E. from U.C., where he is an instructor in mechanical engineering. He has made two trips to Europe to study heating and one to Australia in recent years to study marine air conditioning.

Pages

Radiant Heat 29
By F. W. HUTCHINSON—A system of space heating with great off-peak and low-cost possibilities

Ground Resistance 32
By H. V. STRANDBERG—Extensive study of Northwest soils and transmission tower grounding

ABC's of Relays 36
By E. B. KIPP—Part 6, setting forth the fundamentals of carrier systems, why they are used

Five and Dime 39
Details on a Woolworth store in Seattle which has installed new lighting electric cooking, etc.

Plus Business on Ironers 49
About an appliance sales campaign which shows that ironers can be sold if you tackle it right

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Cover: PG and E photo—"Snow Gaging"

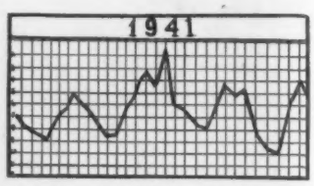
Preview

The Year Ahead

In warlike '41 most anything can happen. But some aspects of business '41, and what it means to electrical men, can be measured in advance.

Certain it is that utilities will be involved in the defense program, that the pace of all sorts of enterprise will quicken, accelerating the demand for service, for appliances, for load. Just how '41 looks as the year begins will be outlined in the February issue.

The February issue is an annual event, summarizing electrical activities in the West for the year just past and forecasting those for the year ahead. Neither the summary nor the forecast is opinion. Each is essentially a poll of actual operations in the industry. Except that



instead of being small, the sampling covers more than 90% of all electrical enterprise in the eleven Western states.

Chief engineers will report their construction budgets, sales managers their quotas. All will be digested, tabulated and organized for quick reference to a particular field. The opening article will deal with the part electrical men may expect to play in national defense.

Along with this will go the basic data on Western generation, customers, installed capacity. In addition to the 30-page survey will be full news coverage, lighting, association news, etc.

Hot Water

Donald Duck will be used again to focus attention on the water heating programs of the industry this year.

Sales hints for dealers on water heaters will be singled out in the February Sales Guide. For those handling only small appliances, sales ideas for waffle irons will supplement the Guide.

4-2
Bat
7

WATCH THE FAVORITE—
WATCH *Frigidaire!*

Watch for announcement of the most spectacular line of refrigerators and electric ranges ever offered to the buying public. Now being introduced to Frigidaire Dealers in factory-conducted meetings from coast to coast. Brilliant new models, new advertising and new selling plans—all strategically designed to increase further the predominant sales leadership of Frigidaire Dealers in '41!

REFRIGERATORS

1. Brilliant New Beauty! A world-famous designer creates for Frigidaire completely new [redacted] refrigerator as a beauty note in your kitchen.

2. More Useful Than Ever! New [redacted] compartments—bigger and roomier! New [redacted] up to [redacted] bigger! [redacted] adjustable to suit your needs. Even the [redacted] model selling for only [redacted] is fully-fitted, including [redacted] and [redacted]!

3. Use Less Current! The [redacted] 1941 Frigidaires have [redacted] power to keep food better and freeze ice faster! Yet they cost less to operate than [redacted].

4. Sensational New Values! Choose from [redacted] brilliant models—every one a [redacted] priced [redacted]. [redacted] Cold-Wall prices are [redacted] as $[redacted]... [redacted] Standard models [redacted]! The [redacted] a genuine Frigidaire "Six," SELLS FOR ONLY ... $[redacted].

ELECTRIC RANGES

1. Brilliant New Beauty! New concepts of range beauty, created by a world-famous designer include [redacted].

2. More Useful—Faster! Exclusive advantages assure [redacted] more care-free cooking. New [redacted] are [redacted] known!

3. Use Less Current! Lowest cooking cost in Frigidaire history. New [redacted] units [redacted] more efficient. Exclusive [redacted] save up to [redacted] on current.

4. Sensational New Values! [redacted] brilliant models. Everyone an outstanding [redacted]! Prices start at only [redacted].

THE SAME *Leadership in Action*

THAT SOLD OVER 600,000 REFRIGERATORS IN 1940

SCORES AGAIN IN '41!

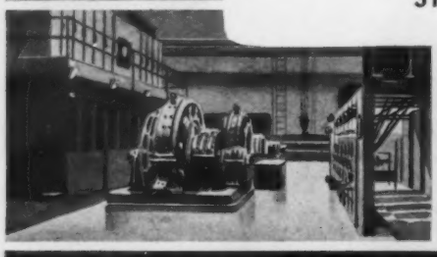
PRINT IN BINDING

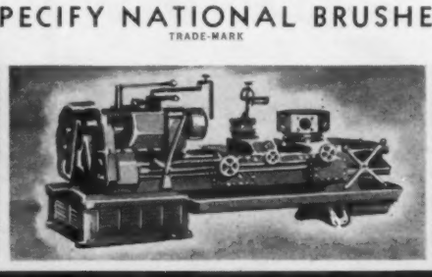
Contributes to dependable performance

● Good commutation is one of the most important factors in obtaining dependable performance and minimum maintenance expense on commutating equipment. In the development, manufacture and application of "National" carbon brushes, special attention is given to the commutation requirements of the service for which each grade is designed. As a result, "National" brushes have achieved a reputation for outstanding commutating qualities.

National Carbon Company representatives are always ready to help solve your commutation problems. Write or wire to our nearest Branch Sales Office.

SPECIFY NATIONAL BRUSHES
TRADE-MARK





NATIONAL CARBON COMPANY, INCORPORATED
Unit of Union Carbide and Carbon Corporation
Carbon Sales Division: Cleveland, Ohio . . General Offices: 30 E. 42nd St., New York
BRANCH SALES OFFICES: NEW YORK PITTSBURGH CHICAGO ST. LOUIS SAN FRANCISCO

UCC

If you are not receiving these practical bulletins on brush operation send us your name and address.

ANNOUNCING!

NEW LOW PRICES ON

HOTPOINT CALROD

ELECTRIC RANGE REPLACEMENT UNITS!

UTILITY SIZE
WAS $7.00 . . . NOW $5.95

GIANT SIZE
WAS $9.00 . . . NOW $7.95

(Includes stainless steel adapter rings)

NOW a minimum number of adapter rings fit practically all makes of electric ranges. Benefit by this low investment. Cut inventory—add to Profits!

Today 2½ Million Electric Ranges Need Modernization

Get in on this rich market which Hotpoint Calrod opens for you with the 2-Way Profit Plan!

1. MODERNIZE OLD ELECTRIC RANGES

2. SELL NEW HOTPOINT ELECTRIC RANGES

WITH the sensational new price reductions, you can cash in on the public interest in "Measured Heat" cooking by modernizing old-style electric ranges. It's a great prospect-getter, leads to new sales of Hotpoint Electric Ranges as well. Two profit chances for you. Call your distributor or Hotpoint district representative now. Edison General Electric Appliance Co., Inc., 5612 West Taylor Street, Chicago, Illinois.

NEW 1941 HI-SPEED HOTPOINT CALROD

—is the only unit with terminals on the side, away from spillage.

—is the only unit with *Inconel* metal tube containing more than 3½ times as much nickel-chromium as any other unit.

—is the only unit built of corrosion-resisting materials throughout.

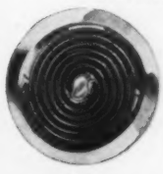
—is the only unit with bushing glass-sealed terminals, insuring longer life.

FASTER STARTING—more efficient, more durable than ever before—yet uses less current!

SELF-CLEANING—normal spillage is quickly consumed in the glowing heat of the self-cleaning coils.

REMOVABLE REFLECTOR—one-piece, polished aluminum reflector pan "pops" out—can be washed like a pie tin.

UNDISPUTED LEADER AMONG COOKING UNITS



YOU CAN *SEE* THE DIFFERENCE

OLD **NEW**

Hotpoint CALROD

THE ONLY ELECTRIC RANGE SURFACE UNITS WITH INCONEL SHEATH AND GLASS SEALED TERMINALS

OFTEN IMITATED
. . . NEVER EQUALLED

"Since 1857"

JAWS that grip like a vise—knives that shear through the toughest wire—handles with just the right spring for comfort—that's Klein pliers!

Ask any man who knows good tools—he'll tell you, "Klein's for satisfaction"—every time!

Your copy of the Klein Pocket Tool Guide will be sent on request.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor:
International Standard Electric Corp., New York

Mathias **KLEIN** & Sons
Established 1857 Chicago, Ill. U.S.A.
3200 Belmont Avenue, Chicago, Illinois

MAGAZINES
in quick review

● STRANGEST READING in the electrical magazine world these days is to be found in the periodicals of war-torn countries. So much of every issue appears unchanged. Ordinary articles and ordinary ads give you the feeling that perhaps the war is just a dream. But you turn the page, and there's an ad for an air-raid shelter. With magnificent oblivion to the havoc raging around, the dignified *Engineer*, published in London, included in its last issue an article entitled "Mathematics from the Engineering Viewpoint." The article which followed this was "Air Force Targets in Germany."

Engineering for Defense

"Unit Substations for Industrial Service," *Electrical World*, Dec. 14, p. 60, has value for those contending with the problem of hooking up defense load in a hurry. It is written jointly by DuPont and G-E men and tells how five unit installations in a textile plant saved the cost of a larger substation.

Nomography

"Nomography for the Electrical Engineer," *Electrical Engineering*, December, p. 505. Occasionally an engineer is looking for a basic article on a new method. For those interested, here is one outlining principles of nomographic charts and giving examples of their application.

Fluorescent Fixtures

"A Review of Fluorescent Luminaire Design" makes the Nov. 25th *Magazine of Light* of G-E an exceptionally useful reference medium for the application and design of fluorescent lighting equipment. The issue contains many other lighting suggestions, particularly one for lighting of a difficult, ornate executive office.

Series Capacitors

"Series Capacitors for Distribution Regulation," *Electrical World*, Nov. 30, p. 36—written by a Westinghouse man, incorporating charts for simplifying the procedure of calculating the necessary capacitance and the extent of various effects. This fills in a gap in data easily available to the distribution engineer. It is part of Electrical World's series of articles on "Programmed Distribution."

Christmas—and War

"Mr. Pratt's Christmas Carol" in *Forbes* for Dec. 15th recounts a familiar story to electrical folk in California, that of Clarence "Sandy" Pratt, founder of the Outdoor Christmas Tree Assn. The same issue contains an article, "Power to Burn," by F. H. McConnell, telling of power preparedness by private utilities in America.

Here's Better Business for You
BANKING BY MAIL

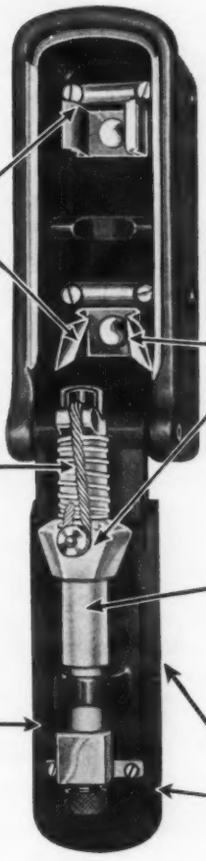
We can help your business by making some of your work easier. With our Bank-by-Mail Service you save time and trouble by handling most details right in your office, store or home, day or night when most convenient. Why not open an account today, by mail?

CROCKER FIRST NATIONAL BANK
OF SAN FRANCISCO
California's Oldest National Bank
Member Federal Deposit Insurance Corporation

LOWER HEAT RISE
NO BURNED CONTACTS
SURE INDICATION

Substantially built!
Two sizes:
50 amps., 5 KV
50 amps., 7½/12½ KV

Door stays closed!
Dirt, rain, snow
and ice stay out
but it indicates!



Old fashioned tried and true area contacts of phosphor bronze prevent excessive heat rise.

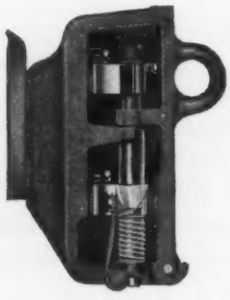
Wedge contacts take up 3/8 inch slack if carelessly left in links, and provide recoil on shorts.

Stainless steel spring puts normal tension of less than 2½ pounds on link, therefore no over-tensioning of links.

Shows fuseholder properly fused and ready to be closed in to housing. Door is easily attached in this position.

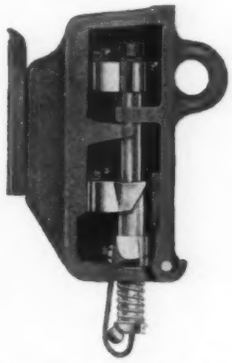
Fuseholder and door are removed or replaced as a unit. The door does not drop out.

Note the clean simplicity and absence of weak or complicated parts or mechanisms.



Phantomized to show
closed position ready
to operate

No other Porcelain Housed Primary
Cutouts give you as many advantages
as these time-tested Dropdown
Indicating Type Matthews Cutouts
Send for Bulletin 500-A
Try them at our risk.



Shows indicating position
with Fuse Link
separated

W. N. MATTHEWS CORPORATION, ST. LOUIS, U. S. A.

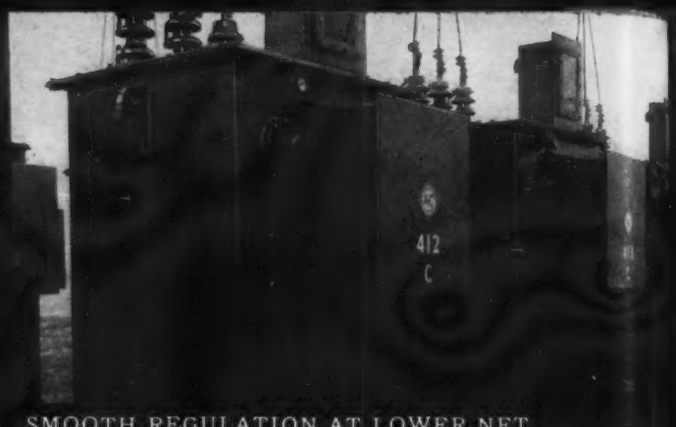
JOBBERS SUPPLY COMPANY
Seattle and Portland

WESTERN REPRESENTATIVES
WALTHAM, DeWITT & KRUSI
San Francisco

INDUSTRIAL ENGR. & EQPT. CO.
Los Angeles

ARE YOU BUYING FIXED CAPACITORS

For your Distribution Feeders?



SMOOTH REGULATION AT LOWER NET cost characterizes these Allis-Chalmers Step-Type Regulators installed by a large utility.

Read How You Can Save Money by Cutting Exciting Current. Get the Whole Story on How You Can Cut Your Costs by Installing Allis-Chalmers Step-Type Feeder Voltage Regulators!

Is your equipment carrying the costly burden of wattless current? Are you installing fixed capacitors to raise the power factor of your system? Then here's a story that means savings to you!

A middlewest utility recently installed eighteen 60 kva, 2400 volt Allis-Chalmers Step-Type Regulators. The exciting requirement for these regulators was less than one-third that of the older type of regulator.

In this one case, fixed capacitors to balance this wattless current would have cost about $1000. And fixed capacitors are being bought for distribution feeders every day! Think what a saving that can mean to you on a large system!

When you install Allis-Chalmers Regulators, you not only cut exciting current . . . you get a regulator that costs less to operate . . . regulates smoothly . . . gives better service!

Not One Contact Replaced!

Complete oil immersion of all moving parts eliminates lubrication. Extra large non-arcing contacts give you longer contact life! For at the time this advertisement was written, *there has not been a single contact replaced on Allis-Chalmers regulators, due to deterioration from normal operation, since they were placed on the market over five years ago!*

And that smooth, steady regulation of 5/8% Half-Cycling Steps means increased customer satisfaction . . . increased revenue for you!

Get all the facts! Send for Bulletin 1183-A. Learn how you can cut your exciting current with Allis-Chalmers Step-Type Feeder Voltage Regulators and get better, low-cost regulation!

1044

INCREASE YOUR REVENUE WITH ALLIS-CHALMERS 5/8% HALF-CYCLING STEP REGULATORS

TRANSFORMER DIVISION

ALLIS-CHALMERS

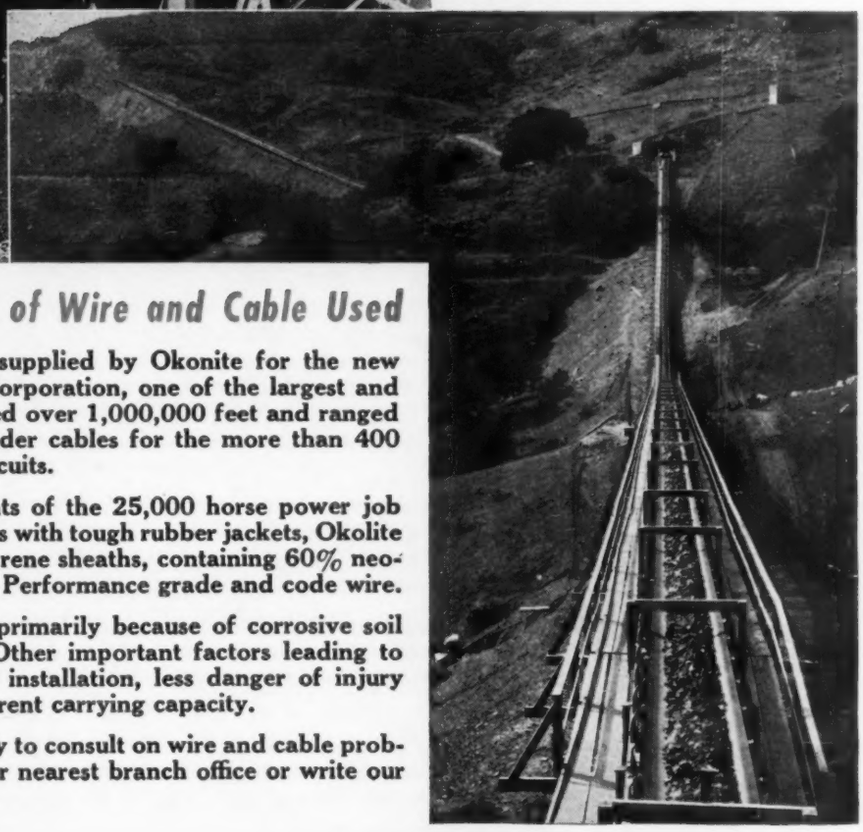
MILWAUKEE · WISCONSIN

PERMANENTE SELECTS OKONITE

For HUGE CEMENT PLANT

10,500 barrel capacity plant of The Permanente Corporation, producers of cement, at Los Altos, California, George B. Scheer, Consulting Electrical Engineer, wired throughout with Okonite wires and cables.

5-yard Bucyrus-Erie electric shovel which draws power through Okocord shovel cable.



Belt conveyor line, capacity 1,000 tons of limestone per hour.

More than 1,000,000 Ft. of Wire and Cable Used

Insulated wire and cable supplied by Okonite for the new cement mill of The Permanente Corporation, one of the largest and most modern in the country, totaled over 1,000,000 feet and ranged from 750,000 CM power and feeder cables for the more than 400 motors to code wire for lighting circuits.

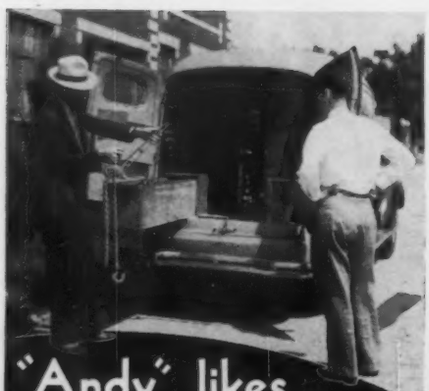
Included in the varied requirements of the 25,000 horse power job were Okosheath non-metallic cables with tough rubber jackets, Okolite feeder cables protected with Okoprene sheaths, containing 60% neoprene, Okocord shovel cables and Performance grade and code wire.

Non-leaded cables were selected primarily because of corrosive soil conditions which attacked lead. Other important factors leading to their adoption were simplicity of installation, less danger of injury during installation and greater current carrying capacity.

Okonite engineers are always ready to consult on wire and cable problems, large or small. Call upon our nearest branch office or write our Engineering Service Department.

THE OKONITE COMPANY
PASSAIC, NEW JERSEY
Offices in principal cities

OKONITE OKONITE **INSULATED WIRES AND CABLES**



"Andy" likes to demonstrate these CHANCE TOOLS • • •

The TIPS TUGGER

"Andy" Anderson, one of the A. B. Chance Company demonstrators, takes great pride in showing the Tips Tugger, because its operation is so smooth, so fool-proof and it will handle so many varied jobs in varied positions without binding. It is light weight with ratchet handle and friction brake. Working parts are encased in grease-tight housing. Made for ¾ ton and 1½ ton capacity. Consult your Chance Catalog, or ask your jobber.

The Reversible Point PIKE POLE

This new Pike Pole is another source of "Andy's" pride and joy. The point may be removed and reversed in the ferrule for safety in transportation. When it becomes worn it may be replaced with a new point at negligible cost; no need to buy a complete new pole. The pole itself is made of high grade Western Fir, free from all defects and lacquer finished. A ferrule protects both ends. Either spiral or straight points are available.

CONSULT YOUR CHANCE CATALOG OR WRITE

A·B·CHANCE CO. CENTRALIA MISSOURI

Roving Power Plants

"Power Plants Take to Wheels and Water," *Electric Light & Power*, December, p. 40, gives miscellaneous dope on mobile generators, both of the rail and water type, which have been making newspaper headlines lately in connection with national defense.

Connecting Transformers

"Old Transformers Take on New Job," *Electric Light & Power*, December, p. 44, will be interesting to Westerners because it deals with a local installation—Edison—PG and E interconnection. Written by A. A. Kroneberg of Edison.

Air Conditioning—Buildings

"Influence of Air Conditioning On Structural Design," *Engineering News-Record*, Dec. 5, p. 44. Background reading for air-conditioning men. It analyzes a new Houston skyscraper, telling how provision for air conditioning affected design of the building as a whole.

F-M Fundamentals

"Evolution of Frequency Modulation," by Edwin H. Armstrong, *Electrical Engineering*, December, p. 485. Armstrong will be remembered as the torch bearer for frequency modulation, and this article will be recalled by many as the speech he gave at the Pacific Coast AIEE convention. It is basic, describing development, status quo and probable applications in the future.

Steam Plant Survey

"1940 Design Trends in Steam Capacity," an insert of 8 p. in the Nov. 30 issue, *Electrical World*, digesting the essential data concerning the year's new steam plants. It is based on a far reaching survey in which designers of the various systems contributed a wealth of data. A brief description of each plant is given.

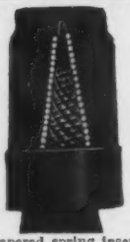
Lots About Lighting

Illuminating Engineering, the transactions of the Illuminating Engineering Society, for December, 1940, contains full text of several papers presented at the recent convention which should have particular local value. "Effects of Classroom Lighting Upon Educational Progress and Visual Welfare of School Children" by Luckiesh and Moss for those working with school lighting; "Alternating Current Circuits for Fluorescent Lamps" by R. F. Hays and D. S. Gustin for utility engineers concerned with the power factor and wave form problem; "Bactericidal Ultraviolet Radiation and its Uses" by H. E. Rentschler for physicians, meat and food processors, and others concerned with bactericidal effect of light on air; and "Progress in Rating Residence Luminaires" by Wm. F. Little for those interested in domestic lighting, will be found of interest.

Outlets for Laundry Sales

"Facing the Enemy Within," a story of the need of washer and ironer dealers for good business practices, by E. D. Hotaling, western division manager, Apex-Rotarex Corp., Oakland, is the feature article in the December *Appliance Journal*.

Wire Nuts



Tapered spring insert presses clean threads into wires — acts as current-carrying sleeve. ¼" moulded composition shell unaffected by heat, cold or moisture.

STANDARD THE WORLD OVER!

IDEAL FOR FLUORESCENT WIRING

- Just strip wires—screw on—that's all!
- No solder, no tape, no blow torch!
- Better electrically—stronger mechanically.
- Not affected by heat, cold or moisture.
- Make craftsmanlike job.
- Fully approved: Listed by Underwriters' Laboratories, Inc.
- Inspectors O.K. quickly—MILLIONS IN USE!

IDEAL SOLD THROUGH JOBBERS

Electrical Products Division
IDEAL COMMUTATOR DRESSER COMPANY
1042 PARK AVENUE SYCAMORE, ILLINOIS

Cook better for less!

CHROMALOX RANGE UNITS

Sell low-cost cooking with ranges equipped with these units. And sell fast cooking, too! Chromalox units cook food as fast as food will cook. Easy to clean—just wipe off the flat top. Nothing to take apart.

Use Chromalox Units for replacements—they fit all ranges. Write for new book, "How to Sell More Ranges."

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
2333 N. W. Westover St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
420 S. San Pedro St., Los Angeles, Calif.
THE PETERSON COMPANY
1921 Blake St., Denver, Colo.
EDWIN L. WIEGAND CO.
7540 Thomas Blvd., Pittsburgh, Pa.

AS the country's industry swells toward peak capacity, power, light and communication systems must be marshalled for peak service... General Cable serves these systems with the most complete line of electrical wires and cables available in America—and every item is of the uniformly high quality expected of General Cable products.

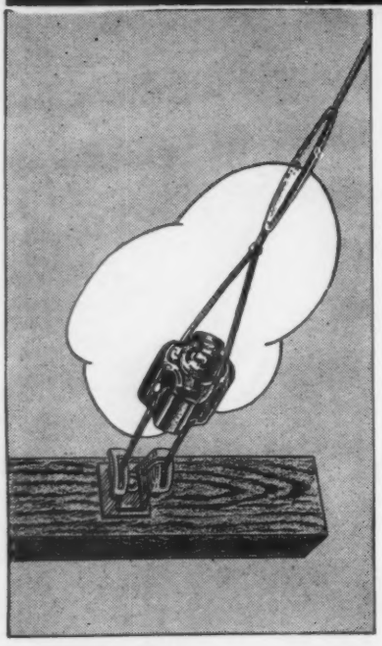
GENERAL CABLE

GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON
KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

modernize
YOUR
DISTRIBUTION
PRACTICE—



RELIABLE
STRAIGHTLINE
SPLICE ADAPTER

Reliable double D deadend - adapters permit deadending with a standard splice — easily slipped around a spool or through a strain insulator.

For economy in stocking, and convenience in installation.

Will hold wire to full breaking strength.

Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Finding Underground Faults

"Locating Faults on Buried Cables," *Electrical World*, Nov. 30, p. 42, is one of those fundamental articles of interest to underground men. It deals particularly with streetlighting, 4- and 13-kv. buried cable, describing test methods and schedules.

About Adequate Wiring

"A Record Sale Via Adequate Wiring" told by Walter L. Stickel, former field man for Electric Development League of Southern California, tells the *Wholesaler's Salesman* the part played by two wholesalers in supplying the Wyvernwood housing development in Los Angeles—the December issue.

BOOKS
you may want

FPC Directory

DIRECTORY OF ELECTRIC UTILITIES IN THE UNITED STATES, Federal Power Commission, $2, for sale by FPC only. This is a directory of all publicly and privately owned electric utilities in the United States, giving such information as names of officers and directors, assets, operating revenues, number of customers, generating capacity, power generated and purchased, communities served at retail, and at wholesale, corporate control and companies controlled by the utility. In comparison with the Central Station Directory, the only other comprehensive directory of this sort, it presents revenue and corporate information not to be found there, but does not contain the Directory's information on voltage and frequency and wire arrangement, or on systems outside continental United States.

Insulation Standards

ASTM STANDARDS ON ELECTRICAL INSULATING MATERIALS, 1940-41 edition, 340 pp., obtainable from ASTM Headquarters, 260 S. Broad St., Philadelphia, $2. This book is for those concerned with electrical insulation and related materials. Twelve specifications and tests cover flexible varnished tubing, varnished cloth tape (black bias-cut), phenolic laminated sheet, friction and rubber insulating tape, rubber gloves for electrical workers, rubber matting, asbestos yarns and tape, asbestos roving, and cotton tape for electrical purposes. Five standards cover molded insulating materials, and five pertain to plates, tubes, and rods. Other products and methods, too numerous to list, are included.

San Diego Author

"GOLDEN MIRAGES" by P. A. Bailey whose regular job is statistician for San Diego Gas and Electric Co.; published by McMillan Company, New York; $3.00. Started as a hobby, Bailey gathered stories first hand from old pioneers and prospectors, verified them whenever possible, and wrote them into this book to preserve them before all the old timers died off. The book deals with stories of lost gold mines, principally that of the lost mine of Pegleg Smith, other lost mines and hidden treasure stories, the locale of which covers the southwest portion of the United States and into Mexico. The book pictures the desert and the activities of prospectors who searched there for gold. There is a chapter of ghost stories told in the desert. It is a rich mine, if not of gold, certainly of desert legend.

ECONOMICAL
Jeffries Transformers

Reasonable in Price
Reliable in Performance

Jeffries large transformers are priced reasonably—and you can save their first cost in a short time by minimizing current losses. When you use a Jeffries transformer, you can provide voltage change at the point desired, without prohibitive expense.

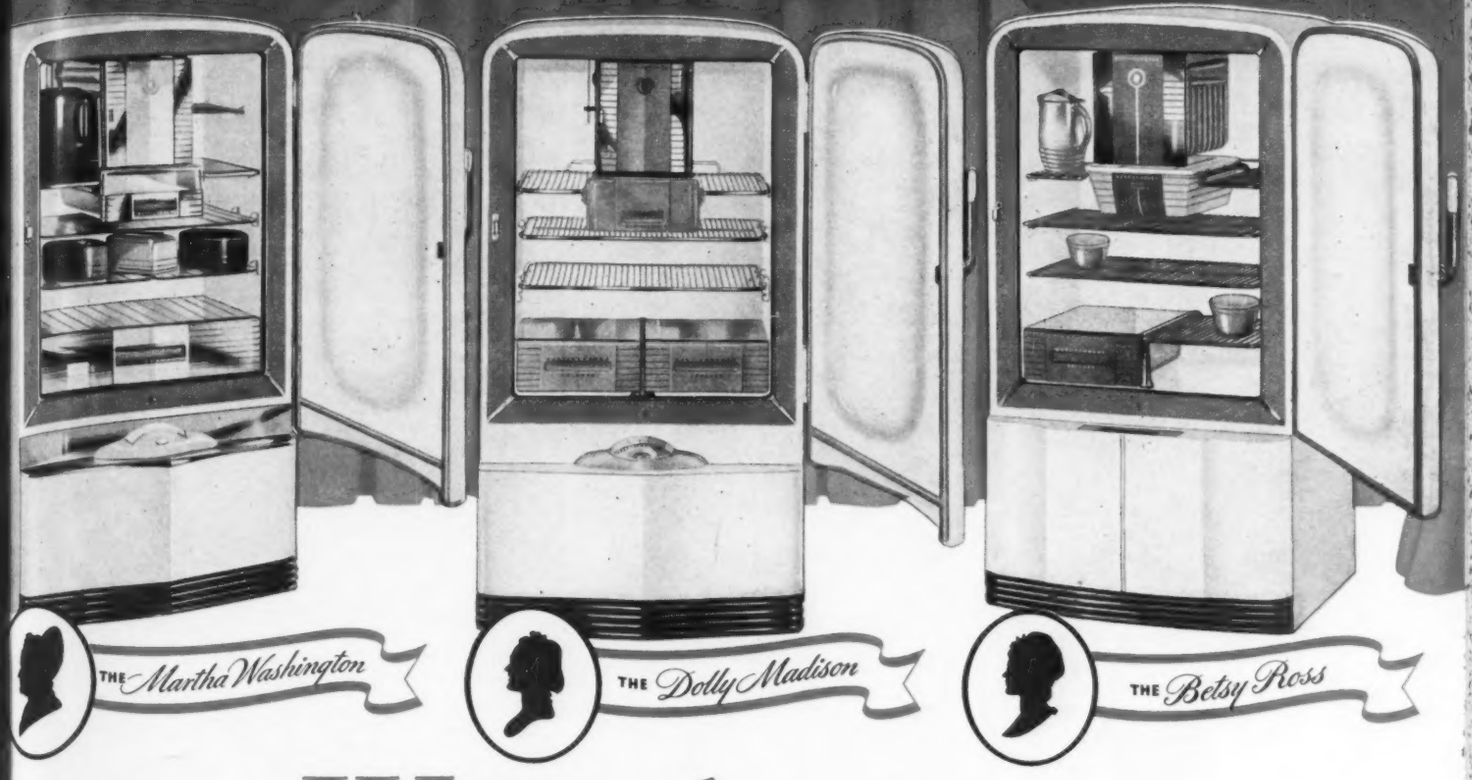
We supply all types and sizes. If not in stock, we build to order in a hurry—a week to 10 days.

Write today for catalog

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

WRITE FOR FOLDER No. 300
TRICO FUSE MFG. CO., Milwaukee, Wis.
M. L. Woodard, 367 9th St., San Francisco
W. E. Young Co., 1944 Broadway, Denver

FOR BETTER LIVING IN THE AMERICAN WAY ★



THE NEW 1941 Westinghouse REFRIGERATORS

are ready!... with

It's the "DREAM LINE" of 1941 —this glamorous new group of COLOR-STYLED Westinghouse Refrigerators! From top to bottom, in every price bracket, there's a model to suit *every* prospect's individual taste.

This new line includes four super-value SIXES . . . two beautiful SEVENS (competitive with most "sixes" displayed by others) . . . and three eye-filling NINE cubic foot models! Popular sizes are available in all-porcelain as well as bonderized Dulux, and there are special models, large and small, to fit every family need.

New Westinghouse models are powered with the famous sealed-in-steel ECONOMIZER mechanism, now quieter and more efficient than ever. Cabinets, frosters and fittings reflect the greatest design achievements in Westinghouse Refrigerator history. And increased production capacity assures an ample supply in 1941 of all popular Westinghouse models.

NEW COLOR-STYLING! SELLING FEATURES!

NEW INCREASED CAPACITY! "STEP-UP" PRICING!

NEW OPPORTUNITIES FOR SALES AND PROFIT!

SEE YOUR LOCAL SHOWING of the COMPLETE LINE

Ask your distributor for the time and place of your complete local Westinghouse showing. See it—get all the facts.

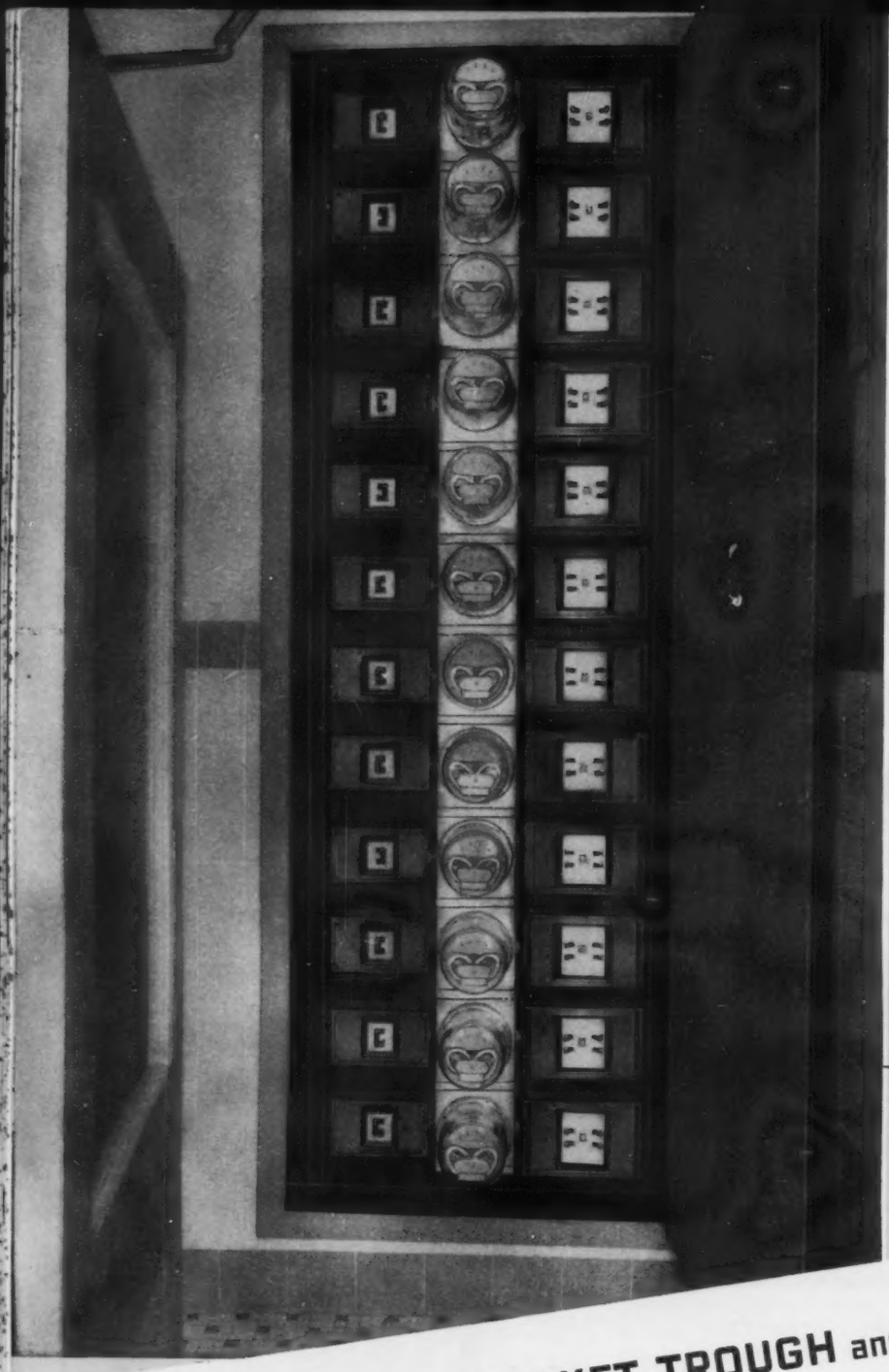
WESTINGHOUSE W

SELL THE DIFFERENT REFRIGERATOR WITH *EXCLUSIVE* TRUE-TEMP CONTROL

Only Westinghouse has TRUE-TEMP CONTROL—a PLUS value that gives users SUPER MARKET Food Protection. A giant advertising and promotional campaign will put this advantage to work for YOU in the public mind. Don't miss out on the extra profits it brings. Call your distributor or write direct for complete details.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
DEPARTMENT 1021 MANSFIELD, OHIO

STEP IT UP *with* Westinghouse *in '41*



FOR NEW CONSTRUCTION OR REMODELING

The remodeled First Federal Savings and Loan Building, Iowa City, in which this Square D equipment is installed.

SQUARE D METER SOCKET TROUGH and MULTI-BREAKERs

● The remodeling of an office building offered a wiring problem which Square D answered with Meter Socket Trough and Multi-breakeRs. The above photograph shows the installation on one of the floors, serving twelve office suites, each separately metered and with main circuit breaker to lock out any service. The specifications originally called for fusible equipment. There were obvious difficulties because of space limitations, so Square D Multi-breakeRs were substituted. Square D supplied the meter trough and the Multi-breakeRs. The contractor did a neat job of assembling. In addition to meeting the limited space requirements, Multi-breakeRs gave the additional advantages of branch circuit switching, non-tamperable protection, and no fuse replacement.

The cost of the entire wiring job was $300 less than with the fusible equipment originally specified.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

Here's to...
Clean Cut Contract Work for 1941

TELESCOPE BM SYSTEM

WE HOPE you have all had a good year, and are all set for an even better one ahead. Many of you are taking full advantage of the simplicity, time saving, material saving and neatness made possible by BRIEGEL METHOD Connectors and Couplings. That's why 1940 has brought us hundreds of new friends. And for 1941, we offer the most highly perfected connector available. Let it help you turn out many fast, clean cut **and profitable** jobs!

BRIEGEL METHOD TOOL CO.
Galva, Illinois

STRENGTH, ruggedness and durability are combined with definite economy in *Crapo* Galvanized Steel Strand. Low first cost, low maintenance expense are matters of record wherever this time-tested product is in use. Available in all standard grades and sizes from representative jobbers throughout the country. Or, write—

INDIANA STEEL & WIRE CO.
MUNCIE, : : INDIANA

PRODUCTS
that are new

Correction

Pictures of two fluorescent luminaires were interchanged in the Dec. issue of ELECTRICAL WEST on page 6. The picture of the Westinghouse Monax glass fixture was shown erroneously with the account of the new Louverglas fixture announced by the du Pont Co., and vice versa.

Big Fluorescent (101)

The largest fluorescent lamp of its line is announced by Westinghouse with the new 100-watt fluorescent type F Mazda lamp. Five feet long, 2⅛ in. in diameter, it is available in 3,500 deg. white color. It is intended for use in stores, offices, industrial plants where higher mounting heights are available and it

is desired to reduce the number of fixtures necessary to supply a given amount of light. The new lamp is rated with initial output of 4,400 lumens and a life of 2,000 hours.

More About It (102)

Three new type F fluorescent lamps are announced by General Electric Co. as available to the trade. One is the new 100-watt 60-in. lamp, a second is the 6-watt 9-in. lamp and the third the new soft white lamp in several sizes and lengths. The 100-watt lamp is designed for general lighting needs where a longer light source and extra illumination with only a slight increase in surface brightness is both economical and effective. It lists at $3.75. It is equipped with mogul bi-pin base and comes in white only. The 6-watt 9-in. lamp uses a miniature bi-pin base and is designed for special use in cabins of airplanes, pullman berths, on business machines, and in curved showcases. The new soft white adds a little color to the previous white lamps and makes it more adaptable to such special applications, as refrigerated cases of meat displays, restaurants, cafeterias, night clubs, beauty salons, homes and displays.

Fixture for It (103)

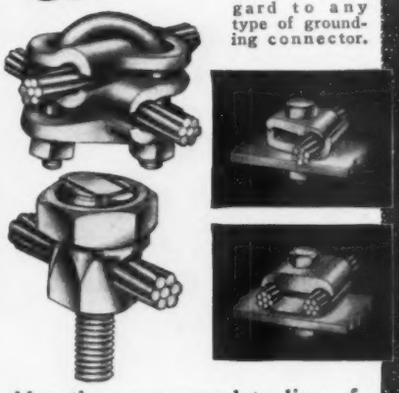
New fluorescent lighting units are announced by Wakefield for use with the new 100-watt, 60 in. fluorescent lamp. Reflectors are provided with unusually deep louvers to provide cutoff. Reflector design direct the ma-

The MOST COMPLETE LINE OF *Grounding Connectors*

These pictures can only give you an idea of the variety, because — **Penn-Union makes ALL good types.** A complete line of clamps, studs and connectors for all applications. For all combinations of pipe, rod, flat bar, cable, braid, tubing.

Every one a **DEPENDABLE** unit of protection for personnel and equipment — of ample capacity, high mechanical strength, and resistant to corrosion.

Write us in regard to any type of grounding connector.



Also the most complete line of Service Connectors, Cable Taps, Terminal Lugs, Tees, and other fittings. *Penn-Union is the choice of leading utilities and industrials, contractors, and manufacturers of electrical equipment.*

NICHOLAS & COOK
1063 HOWARD STREET
SAN FRANCISCO

NORTHWESTERN AGENCIES
2411 FIRST AVE.,
SEATTLE, WASHINGTON
PENN-UNION ELECTRIC CORP., Erie, Pa.

PENN-UNION
Conductor Fittings

YOU'LL BENEFIT 3 WAYS BY USING GENERAL ELECTRIC WIRING MATERIALS

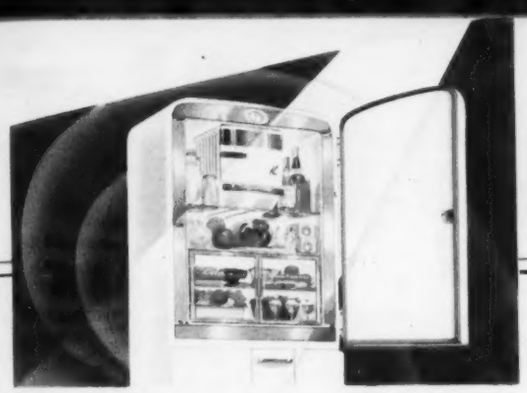
1. A General Electric Merchandise Distributor is located near you. He is there to give you good service on the wiring materials you need.

2. Whether you are wiring buildings for national defense or for conventional use you'll find G-E wiring materials to meet all specifications. Only the finest of raw materials are used in the manufacture of G-E conduit, wire and cable and wiring devices. Rigid tests and precise operations provide dependable uniformity in G-E materials.

3. The G-E wiring material line is complete including materials for wiring every type of building. These materials are designed for use together and can be installed quickly and easily.

For further information about G-E wiring materials see the nearest G-E Merchandise Distributor or write to Section CDW-1181, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC



Another Frank Statement

An announcement of Kelvinator's 1941 Program and how it assures even greater profits to Kelvinator retailers

by FRANK R. PIERCE, General Sales Manager
Kelvinator Division, Nash-Kelvinator Corporation

LAST YEAR Kelvinator retailers made money. In fact, with sales more than 2¼ times those of the year before, we are told by many retailers that this was their best profit year in the refrigeration business.

This was the natural and expected result of Kelvinator's radically different 1940 Program—which brought to the industry as a whole the greatest volume it had ever enjoyed.

It is only natural that the industry today should be watching Kelvinator with the keenest interest—waiting for Kelvinator's next statement of policy.

Now is the time to make that statement.

• *The Kelvinator plan of 1940 was only the first step in a far more inclusive program*—one that has been conceived from the beginning with the needs of the refrigerator retailer—the man who built our industry—as the primary consideration.

I have made the statement many times that it is within the power of the manufacturer and the distributor to relieve most of the problems refrigeration retailers are faced with. I make that same statement again now and say that Kelvinator is determined to continue its efforts in that direction.

Because retailers told us there were too many models, one of the outstanding accomplishments of last year's program was our concentration on fewer models—the big six and eight cubic foot models that people really want.

• *This year we have condensed an entire line of refrigerators into exactly eight models*—six six-footers and two eight-footers. Your inventory investment is less—our manufacturing program is again simplified.

Because we were determined to enable Kelvinator retailers to meet all types of price competition, the announcement last year of Kelvinator's new prices electrified everyone who had anything to do with refrigerators. This year's prices are just as sensational.

• *Kelvinator not only has a more effective price program again*—but even more important *we have built enormously greater value into every model in the line.*

Which brings me to one of the most significant features of the entire 1941 platform.

Salesmen had told us it was almost impossible to logically justify the price differences between low-priced models and fully equipped models.

The Kelvinator Step-up Plan of 1940 you hailed as the best ever devised. In fact, it proved so successful that 80 per cent of all Kelvinator sales averaged $160.23.

• *The Kelvinator Step-up Plan of 1941 is a salesman's dream.* Briefly, it is based on a price scale in which the exact *value* of the features in every model determines its cost.

Kelvinator salesmen will not have to justify a substantially higher price on the basis of obviously inexpensive gadgets.

The 1941 Kelvinator Step-up Plan is so logical and so easy to visualize that we say Step-up *Buying* will replace Step-up *Selling*.

And the models which your prospects will *buy* most readily are the ones on which your *profits* are the *greatest*.

Retailers have told us that there are too many competing outlets for electric refrigeration.

Last year we inaugurated a plan to limit the number of dealers in each community so that each dealer could obtain a sufficient volume at full retail prices to make a real profit. This plan proved highly successful.

• *This year we are projecting an even more comprehensive system of protected markets,* which can be summed up in the phrase—"A dealer for every market—a market for every dealer."

I come now to the climax of our 1941 story.

No plan—no program—however carefully conceived and executed, can be lastingly successful without an outstanding product.

Kelvinator *has* that product.

• *A brand new refrigerator.*

• *A new kind of refrigerator.*

And, frankly, we're as proud of the 1941 Kelvinator as a father with his first son.

But no words of ours can possibly give you a true picture of the beauty of this new and utterly different 1941 Kelvinator. When you see it I think you will agree with the people who call this "The Most Beautiful Refrigerator in the World."

• And, in addition, Kelvinator retailers will welcome the news that for 1941 the Kelvinator Electric Range Program will be just as aggressive and just as complete as the Kelvinator Electric Refrigerator Program. The same principles apply—fewer models—increased production—lower prices—and a profitable franchise.

We're getting off to a fast start in 1941.

And I frankly believe that this is going to be the biggest and most profitable year we and our retailers have ever enjoyed.

We've burned a lot of midnight oil to create an unbeatable combination of product, price and strategy.

This is the year to cash in.

I suggest that you get in touch immediately with your nearest Kelvinator distributor or factory branch.

Or, if you like, communicate with me direct.

Frank R. Pierce

General Sales Manager
KELVINATOR DIVISION
Nash-Kelvinator Corporation, Detroit, Mich.

Introducing a New

STEP-UP BUYING REPLACES STEP-UP SELLING

Model SS-6—A big 6¾ cu. ft. model. New Kelvalyte trim on cabinet throughout to replace old-style breaker strip. There's a big Moonstone glass chill tray under the Freezer Unit. Two extra-fast Freezing Shelves give an 84 ice cube capacity—9 lbs., 11.8 sq. ft. shelf area. *Plus* all of the basic 1941 Kelvinator features listed at the right. . . . . Price is only **$114.75***

Model D-6—A 6¾ cu. ft. equipped model. Has a big Sliding Kelvin Crisper with porcelain top. Easy-to-clean, stainless steel Cold-Ban. Moonstone glass Cold Chest. Two extra-fast Freezing Shelves. 4 Pop-out Ice Trays with 64 ice cubes—8 lbs. capacity. 11.8 sq. ft. of shelf area. *Plus* all of the famous basic 1941 Kelvinator features. . Only **$124.95***

Model S-6†—*Completely equipped* 6¾ cu. ft. model. 5-Way Magic Shelf. Glass-covered Sliding Crisper with increased capacity. Moonstone glass Meat Chest with glass cover. Stainless Steel Cold-Ban. Vegetable Bin. Sliding half-shelf. 4 Pop-out Ice Trays with 64 ice cubes—8 lbs. capacity. 11.8 sq. ft. shelf area. 2 extra-fast Freezing Shelves. Plus all basic 1941 Kelvinator features. . Only **$139.95***

*In 8¾ cu. ft. size Model S-8 only $179.95**

FOR months now the little man in the Kelvinator ads has been saying "You ain't seen nothin' yet."

Well, here it is—the answer to a merchant's prayer—a sweetheart in gleaming enamel and stainless steel and crystal-clear glass.

And a step-up plan so logical—so fool-proof—that you no longer have to *sell* them up—they *buy* up!

• The '41 Kelvinator not only *looks* different—it *is* different.

The cabinets are one piece sides and top, welded, rigid steel—not a tooth-pick of wood anywhere. And although sizes have been increased so that a six-foot model is now more nearly seven feet in size, the rear of the shelves are inches nearer the front than before.

And around the door opening is the gleaming Cold-Ban of Stainless Steel, which eliminates some 80 hard-to-clean screw-heads found on conventional refrigerators.

• Look at the new Kelvinator again—for *Extras*.

From Model SS-6 to Model D-6—an easy jump of just ten dollars—and your customers get a big Sliding Crisper—Stainless Steel Cold-Ban—Moonstone Cold Chest—4 Pop-out Ice Trays.

• Then step up to the famous model S-6—(counterpart of the most popular model offered to the public all last year)—an easy jump of just fifteen dollars—and look again. A new kind of Sliding Crisper with a clear-glass cover . . . 30% bigger than last year. An amazing new Magic Shelf that gives you five finger-tip adjustments and makes possible one of the cleverest and easiest demonstrations ever devised. Salesmen get a big kick out of this easy-to-do Magic Show. And underneath—a Vegetable Bin that holds a bushel and a quarter of dry vegetables.

• Then step up to Model R-6—a jump of only $15 and see what *Extras* you can offer. This used to be a $30 to $40 jump at the very least.

Ninety-nine cubes of ice—12 pounds—50 per cent more than the S-6—not just one Crisper but *two*, covered in gleaming glass—a Removable Freezer Shelf—a double width Dessert Tray—Complete Deluxe Equipment.

• Step up again—and you have the PS-6—twin of the S-6 except that it's a *Porcelain* cabinet for only $20 more.

• Then move on to the crowning achievement of the Kelvinator line—the Moist-Master for 1941—a new kind of refrigerator and a new kind of refrigeration.

It's just twenty dollars higher in price—and it's so beautiful it takes your breath away.

Shelves are of crystal clear glass. *And* it offers an entirely new principle of refrigeration.

In addition to the coils that freeze ice, there's a separate set of coils concealed in the walls. These *refrigerating* coils maintain correct humidity and temperature *throughout*. No

Kind of Refrigerator

1941 Kelvinators have these Important Features

One-Piece sides and top, welded cabinet construction—no seams—no crevices to collect grimy dirt.

All-Steel cabinets—there's not a tooth-pick of wood.

Gleaming Permalux exteriors, with Porcelain-on-steel interiors. (Model PS-6 has Porcelain-on-steel *exterior and interior.*)

New automatic Polar Light that lights up the interior of the Freezer Unit as well as the cabinet.

Space for Frozen Foods.

Stainless Steel, High-Speed Freezer with Porcelain-finished door.

Kelvin Cold Control with 13 settings and "off".

We believe the famous Polarsphere Sealed Unit has the greatest record in the industry for service-free performance.

†**Porcelain Model PS-6**—With all features of S-6 *plus* porcelain-on-steel exterior. . Only **$159.95***

Model R-8—Complete *Deluxe* equipment and styling. 6¾ cu. ft. size. 99 ice cubes—12 lbs.... 50% more than S-6. Not just one but *two* glass-covered Sliding Crispers. 5-Way Magic Shelf. Stainless Steel Cold-Ban. Vegetable Bin. Moonstone glass Meat Chest with glass cover. 2 extra-fast Freezing Shelves. 4 Pop-out Ice Trays, plus double width Dessert Tray. 12.6 sq. ft. shelf area. . . . . Only **$154.95***

Moist-Master Model M-8—6¾ cu. ft. in size. Has glass enclosed Cold-Mist Freshener. All shelves of heavy crystal-clear glass. Moonstone glass Meat Chest. 2 extra-fast Freezing Shelves. 4 Pop-out type Ice Trays, plus double width Dessert Tray. 99 cubes—12 lbs. capacity. 12.6 sq. ft. shelf area. Stainless Steel Cold-Ban. Vegetable Bin. . Only **$179.95***

*In 8¾ cu. ft. size Model M-8 has 4 Speedy-Cube type Ice Trays plus double width Dessert Tray. 107 cubes—12 lb. capacity. Only $209.95**

*Prices suggested are for delivery in the kitchen with 5 Year Protection Plan. State and local taxes are extra. Prices are slightly higher west of the Rockies.

need to cover dishes. In the super-moist glass-enclosed Cold-mist Freshener, still air, wall-cooled, guards food freshness . . . protects precious vitamins.

• Add to these big 6-cubic ft. Kelvinators the two eight-foot models—and you have a model to meet *every* requirement.

You have, in fact, *Step-up Buying.*

• For each successive model in the line is *easier* to sell than the model before it.

You can see right now why Kelvinator retailers are in for a whale of a big and profitable year.

• It's the most important *new* refrigerator achievement in years. It makes the owners of conventional refrigerators dissatisfied. It offers definitely and demonstrably *more* of *everything.*

And we're not going to hide our light under a basket, either.

Kelvinator today is *News* and we're going to make sure that that news gets the break it deserves.

• Four-color magazine spreads and pages, Newspapers, Spot-Radio—all will blast out the Kelvinator message. "Look at the Beauty—Look at the Extras—Look at the Price . . . Get More . . . Get Kelvinator."

• There it is—Product—Price—and Selling Punch. Add to it the one all-important ingredient—You—the Progressive Retailer—and you have the Success Story of 1941.

Look at the Beauty! Look at the Extras! Look at the Price!

A MARKET FOR EVERY DEALER • A DEALER FOR EVERY MARKET

and a Radically New Range Program

A complete Line of Ranges Telescoped into Three Amazing Values

For only $99.95*
this low-priced prospect-getter!
Lamp, Timer and Condiment Set Extra
For only $139.95*
a wealth of features at a popular price!
Timer and Condiment Set Extra
For only $169.95*
a deluxe model at a sensational price!

Model ER-411—One-piece "wrap-around" steel body—5-Heat silver contact surface unit switches—combination oven switch and thermostat with automatic preheat cut-off—"Broil" and "Bake" pilot lights—2-unit oven—Fiberglas insulation—6-Quart Scotch Kettle—Ball-bearing storage drawer.

Model ER-413—Popular priced model with all features of Model ER-411, and many extras—7-Heat Surface Unit switches with individual flood lights that indicate when switches are "on"—Deluxe-type Scotch Kettle with self-basting lid—Automatic light in oven—Three ball-bearing storage drawers—Non-glare top lamp.

Model ER-417—All Deluxe "extras"! Built-in Cooking Timer combining electric clock, computing Timer, and "Minute Minder". Selector Switch connecting Timer with oven, Scotch Kettle or appliance outlet—Warmer-Drawer with automatic temperature control—Deluxe Scotch Kettle with insert pan, basket, and thermometer.

**Suggested prices delivered in the kitchen east of Rockies—slightly higher west of Rockies. Wiring, if any, and state and local taxes extra.*

"IT worked with refrigerators—now let's apply it to ranges!" That summarizes the 1941 strategy for the Kelvinator Electric Range.

For *this* is Kelvinator's year.

The '41 range program is just as logical, just as certain of success as that which startled the Refrigeration Industry last year.

The objectives are the same—to crack open a vast new market—to meet and defeat the competitive price situation—to simplify dealers' selling, stocking and investment problems—to enable dealers to make more profits.

And the same proved methods have been applied—fewer models, meaning lower production costs—vastly increased production and sensationally lower prices that smash the greatest obstacle encountered in range selling.

For 1941 Kelvinator telescopes a complete line into three models. That means a smaller investment for you, a simplified display problem, an easy line for salesmen to master and sell, and an easier choice for buyers.

PRICES ARE FROM $20 TO $30 LOWER THAN THOSE OF COMPARABLE MODELS LAST YEAR. Starting with a low-price basic model at less than $100, the line leads buyers easily through only one intermediate step to the deluxe model.

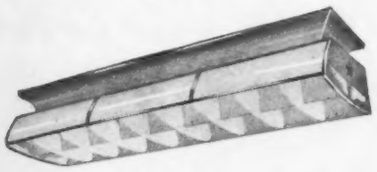
But one of our Biggest features is Kelvinator's answer to the problem "How to Sell the Prospect." We're filling this need with a practical "down-to-brass-tacks" program!

Focal point of the entire program is the brand new Kelvinator "Salesmaster"—a most beautiful, practical and THOROUGH selling tool—a complete presentation of all you need to sell electric cooking and Kelvinator Electric Ranges. *Plus* other time-proven selling aids—national advertising, local advertising, sales training, store demonstrations, traffic building promotions. And THE MOST ATTRACTIVE STOCKING DEAL YOU'VE EVER BEEN OFFERED.

Get in touch with your nearest distributor or factory branch—or wire or write to *Range Division*, NASH-KELVINATOR CORPORATION, DETROIT, MICHIGAN.

Get More—Get KELVINATOR

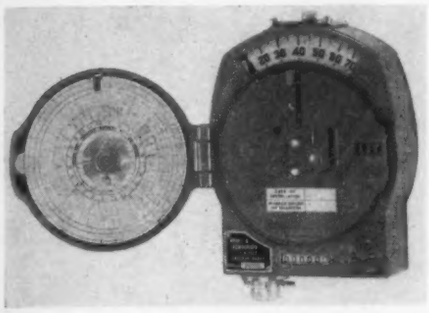
jority of the light downwards with an open area at the top to permit illumination of the ceiling. Sides of reflector are luminous translucent plastic material with external parts



plated in satin cadmium. One unit is designed for fastening direct to the ceiling, the other is of a stemmed suspension type. Two lamps are used in each of the fixtures.

Tachograph (104)

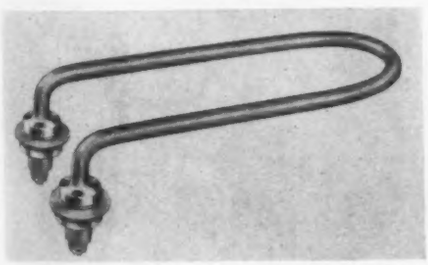
Tachograph is the name of a combination recording speedometer and clock developed by Sangamo Electric Co. It is intended especially for use in truck and bus operation and what it does is provide, automatically, a log which will enable owners to check items of time and



cost which will reveal the most economical route to be traveled and the best time of day or night in which to make runs. The Tachograph provides a graphic chart of the time of operation, speed in miles per hour, the distance driven, and a number of other factors.

Immersion Heaters (105)

Recent developments have made a line of tubular immersion heater units in diameters from 5/16 to ½ in. inclusive, and in lengths



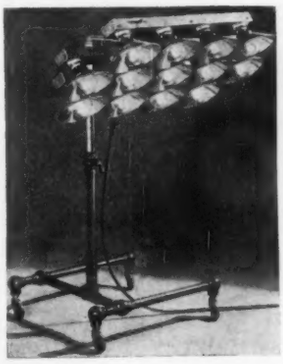
from 1 to 8 ft. These are constructed with a helical coil of nickel chromium resistance wire, imbedded in a refractory material, which is encased in a metal tube. Copper, steel and special high-temperature alloy sheathing is to operate at 1200° F.

Mounting Strips (106)

Standardized mounting strip of stainless steel, with a modern rippled finish with all devices mounted, are being furnished by H. R. Kirkland Co., of Morristown, N. J. One strip may contain any combination of devices as the strip may be joined together to an unlimited degree. All are for service on voltages up to 220 volts and are particularly for application in the signal, control, and general annunciator fields. Each strip is mounted with two screws directly to machines, cabinets, panels, etc.

Infra-Red Dryer (107)

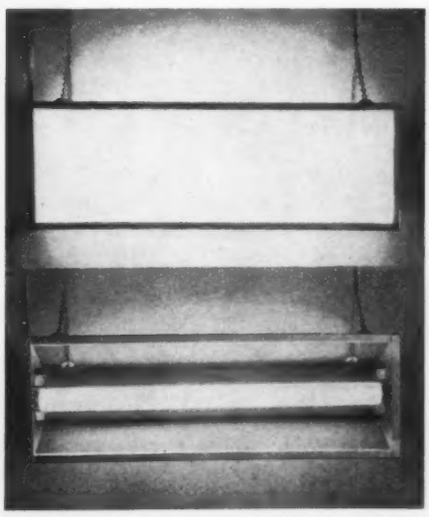
A portable infra-red heating, drying and baking unit is announced by North American Electric Lamp Co., containing 13, 260-watt Nalco dritherm carbon filament lamps and 7⅝-in. polished aluminum reflectors with 15



ft. of approved cord and plug. Switches are mounted on each row of lamps so that a combination of 4, 9 or 13 lamps may be used depending on the area to be covered. It can be raised to a height over 8 ft. or dropped to within 12 in. of the floor, tilted at any angle vertically or horizontally.

Fluorescent Unit (108)

"Fluoro-glow" is the trade name of a 3-way fluorescent unit designed by Wuelker Lighting Co., San Francisco, for a wide variety of commercial installations. The unit reflects light up, down and forward because of the unique shape and position of the reflector. The forward light is diffused by means of a "lamicoid" translucent panel, which is available in white or colors. The screen will accommodate painted or printed lettering, thus permitting the unit to be used to designate various departments or products in a store. The unit is designed for hanging or fastening to a wall, for either portable or permanent installation. Two units may also be fastened back to back. It is available in sizes to accommodate 20, 40 or 100-watt fluorescent tubes. In the illustration it is shown with and without the screen.



BULLETINS

data books, etc.

About Wood Poles (109)

A great deal of helpful information about wood poles—how to figure their cost, how to handle them, how to measure their deflection, how to figure their strength—together with details about pressure treating is contained in the booklet "Pressure Creosoted Poles" offered by the Wood Preserving Corp. of Pittsburgh, Pa.

Insulator Making (110)

"Westinghouse Porcelain" is a 16-page booklet which tells an interesting story about porcelain insulator manufacture. Using pictures and brief explanations, it starts with raw materials and carries the process step by step to the finished product.

Keep Posted for 1c

Your being right up-to-the-minute may have an important bearing on your success. New developments are appearing daily in your field—tools to help you do a better job. Are you abreast of them? You fall back a step when the other fellow is well informed about a subject of which you are ignorant. Manufacturers' publications are a quick, efficient way for you to keep posted on current events in your field.

Isn't it a bargain to invest 1c (the cost of a postcard) to help earning power to which you look forward? American industry is offering a remarkable service—free. ELECTRICAL WEST makes it easy for you to enjoy this service for your own. Check and mail the coupon below. That's all you have to do to help yourself toward better performance and greater rewards.

Fuse Cutuots (111)

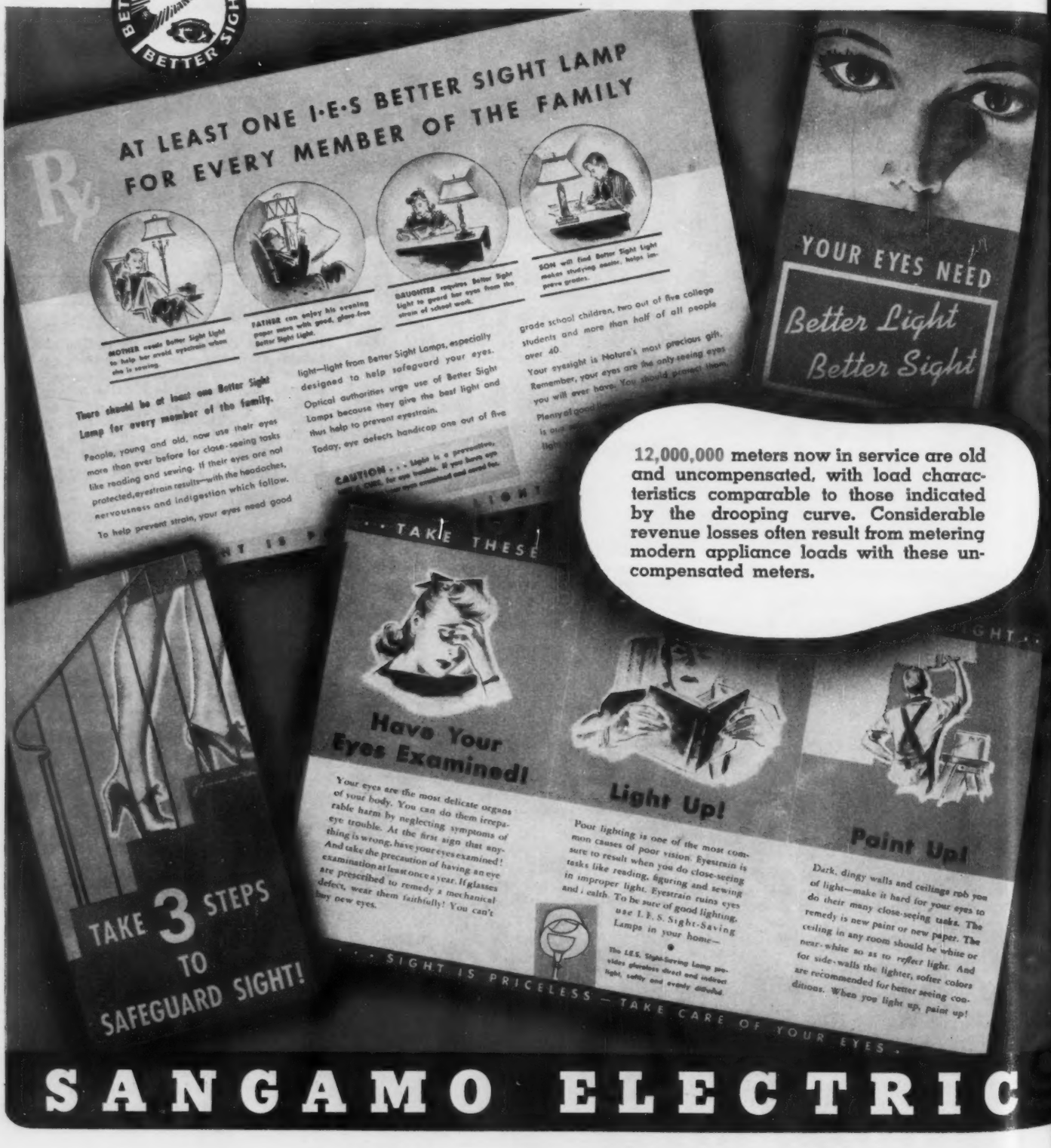
A bulletin of some length, including detailed illustrations and prices is General Electric's GEA-3448 describing enclosed, indicating, and dropout fuse cutouts covering disconnecting and reclosing models with interchangeable doors.

Rubber Cable (112)

Roebling has issued a new and fancy 34-page magazine-type booklet describing rubber-covered wires and cables and service entrance cables. Of general usefulness are a series of tables giving such data as minimum conductor size, conductors and conduits etc. and a series of questions and answers entitled "Easy Examples of How to Use the Tables."

ONLY WATTHOURS *Metered*

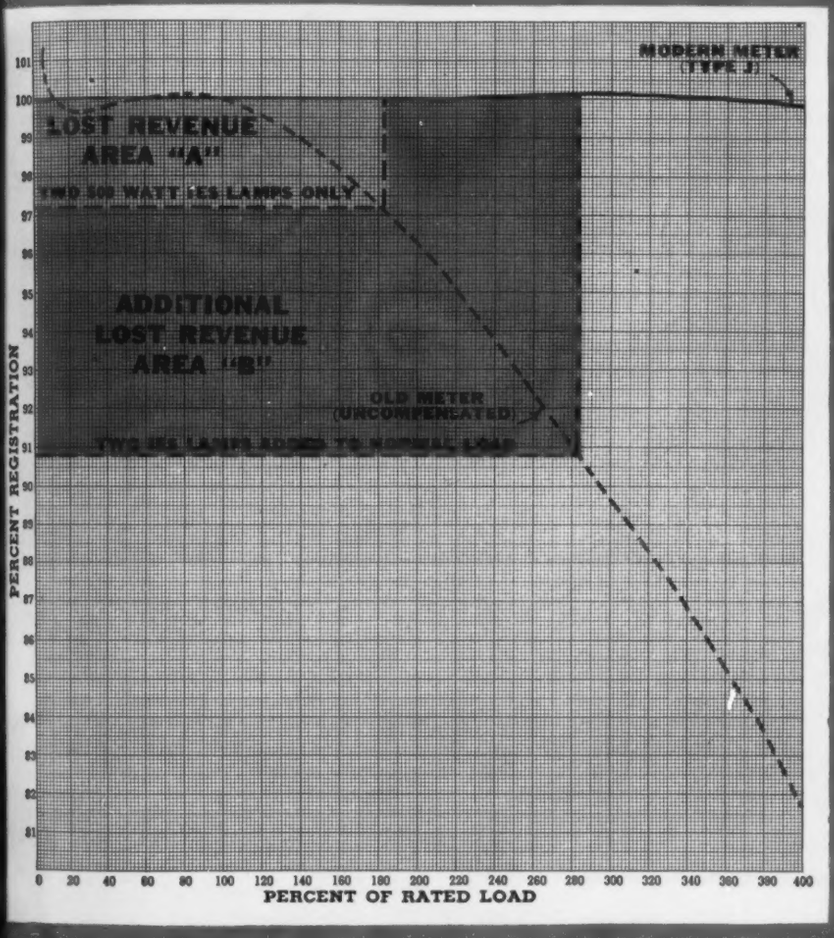
I. E. S. LAMP LOADS ARE PAYLOADS WHEN METERED WITH . .

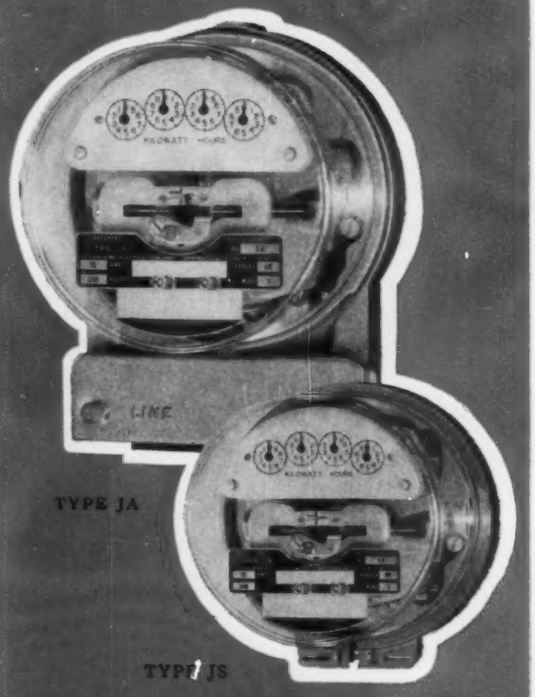

BETTER LIGHT BETTER SIGHT
AT LEAST ONE I·E·S BETTER SIGHT LAMP FOR EVERY MEMBER OF THE FAMILY
MOTHER needs Better Sight Light to help her avoid eyestrain when she is sewing.
FATHER can enjoy his evening paper more with good, glare-free Better Sight Light.
DAUGHTER requires Better Sight light to guard her eyes from the strain of school work.
SON will find Better Sight Light makes studying easier, helps improve grades.
There should be at least one Better Sight Lamp for every member of the family.
People, young and old, now use their eyes more than ever before for close-seeing tasks like reading and sewing. If their eyes are not protected, eyestrain results—with the headaches, nervousness and indigestion which follow.
To help prevent strain, your eyes need good light—light from Better Sight Lamps, especially designed to help safeguard your eyes.
Optical authorities urge use of Better Sight Lamps because they give the best light and thus help to prevent eyestrain.
Today, eye defects handicap one out of five grade school children, two out of five college students and more than half of all people over 40.
Your eyesight is Nature's most precious gift. Remember, your eyes are the only seeing eyes you will ever have. You should protect them.
YOUR EYES NEED
Better Light
Better Sight
12,000,000 meters now in service are old and uncompensated, with load characteristics comparable to those indicated by the drooping curve. Considerable revenue losses often result from metering modern appliance loads with these uncompensated meters.
TAKE THESE
Have Your Eyes Examined!
Your eyes are the most delicate organs of your body. You can do them irreparable harm by neglecting symptoms of eye trouble. At the first sign that anything is wrong, have your eyes examined! And take the precaution of having an eye examination at least once a year. If glasses are prescribed to remedy a mechanical defect, wear them faithfully! You can't buy new eyes.
Light Up!
Poor lighting is one of the most common causes of poor vision. Eyestrain is sure to result when you do close-seeing tasks like reading, figuring and sewing in improper light. Eyestrain ruins eyes and health. To be sure of good lighting, use I. E. S. Sight-Saving Lamps in your home—
The I.E.S. Sight-Saving Lamp provides glareless direct and indirect light, softly and evenly diffused.
Paint Up!
Dark, dingy walls and ceilings rob you of light—make it hard for your eyes to do their many close-seeing tasks. The remedy is new paint or new paper. The ceiling in any room should be white or near-white so as to reflect light. And for side-walls the lighter, softer colors are recommended for better seeing conditions. When you light up, paint up!
TAKE 3 STEPS TO SAFEGUARD SIGHT!
SIGHT IS PRICELESS—TAKE CARE OF YOUR EYES
SANGAMO ELECTRIC

PRINT IN BINDING

ADD REVENUE *Gains!*

Modern Meters


MODERN METER (TYPE J)
LOST REVENUE AREA "A"
TWO 500 WATT I.E.S. LAMPS ONLY
ADDITIONAL LOST REVENUE AREA "B"
OLD METER (UNCOMPENSATED)
TYPE JS LAMPS ADDED TO NORMAL LOAD
PERCENT REGISTRATION
101 100 99 98 97 96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 81
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400
PERCENT OF RATED LOAD



Available in either "A" or "S" mountings, Type J Meters are designed for indoor and outdoor service. Ability to measure accurately loads ranging from a small percentage to 400 percent of the meter's normal full load rating, is an inherent characteristic of the Type J Meter.

STREAMLINED merchandising has sold twelve and a quarter million I. E. S. Lamps . . . Five million of these are the 420 and 480 watt types . . . Another quarter million is the 500 watt single-switch type . . . Surveys show that one third of all I. E. S. Lamp owners use two or more lamps.

That modern watthour meters play a significant part in obtaining full revenue from these added loads is illustrated by the above curves. When measured by an uncompensated meter, two 500 watt lamps alone can cause a registration loss of 2.8 percent, (see "Lost Revenue Area A"). Added to other normal loads, the loss may be as great as 9 percent, (see "Additional Lost Area B").

An adequate survey of individual operating properties will indicate where a change to modern meters will be a profitable investment through revenue gains.

COMPANY SPRINGFIELD ILLINOIS

Thermometers (113)

Equipment for measuring the temperatures of electric power units is described in a Leeds and Northrup Co. 31-page catalogue (M-33-161). It begins with sections dealing with temperature measuring principle, continues with many illustrations, and descriptions of Micromax equipment.

Switches, etc. (114)

Condensed Catalogue 405 has been issued by Bull Dog Electric Products. It is divided into the following sections: Index and price list; safety switches; service equipment; lighting panels; circuit master and other circuit breaker panels; safe to fuse panels; KBL ducts, and miscellaneous devices. Seven pages are devoted to some of the company's new developments.

Small Transformers (115)

16 pages of assembly and installation news of small power transformers is contained in Allis-Chalmers' new bulletin B-6084.

Traffic Log (116)

Sangamo's new Tachograph — a device for making a record of operating time, speed and distance connected with automotive operations —is described in an 8-page bulletin. Besides details on the construction and operation, the bulletin presents two-color reproductions of typical recording charts with explanations of their meaning. It also presents maps and diagrams which serve to indicate how the chart is related to a particular route of travel.

FM Equipment (117)

Frequency modulation equipment is described in General Electric bulletin GEA-3480, giving pictures and details with special reference to equipment for mobile use.

Unit Substations (118)

CST (completely self-protecting) power transformers especially designed for unit substation service on municipal or industrial distribution systems are covered in a 16-page illustrated bulletin by Westinghouse. Descriptions are thorough-going, and included are a complete diagram of connections, characteristic curves.

Welders (119)

Emerson Electric Manufacturing Co., St. Louis, offers an 8-page catalogue describing and illustrating that company's line of a.c. arc welders.

Heavy-Duty Motors (120)

A 4-page General Electric bulletin (GEA-1542D) describes heavy duty d.c. motors. These are available at a constant speed 160 hp. and adjustable speed ½ to 15 h.p. Ratings of 50 to 300 hp. at 1,150 r.p.m. constant speed, 15 to 200 hp. adjustable speed, are covered in GEA-1868B.

Evaporators (121)

Heavy duty evaporative condensers for use with refrigerator systems having capacities of 2 tons or larger are described in new specification sheet by Carrier Corp.

Capacitor Data (122)

Amounting almost to a reference text is a Westinghouse 28-page booklet entitled "Application Data on Capacitors", which deals with capacitor application on distribution circuits. It presents theory, formulas, tables and charts, goes into detail about how and when to apply capacitors, when voltage drop is the controlling factor, when power factor is the leading consideration.

Wire Calculator 123)

A handy pocket-size slide rule type of wire and cable calculator has been issued by General Cable Corp. for wiremen and contractors. On one side through openings in the cardboard face can be read off for any given size of wire the amp. per conductor for the various types of wire and the size of conduit for various numbers of conductors. A temperature correction scale is also printed on the face. On the opposite side is a scale for re-wiring with the SN, RU, RPT and RHT types of wire. The same information for re-wiring is contained in these tables. The scale is worked out to conform to the new wire tables of the 1940 National Electrical Code.

Building Pole Lines (124)

"Haulage Ways" is a magazine issued monthly by Ohio Brass Co. It comprises 7 pages and a cover, describes various OB equipment and carries one article. In the January issue is Part III of "How to Build Low-Voltage Wood-Pole Transmission Lines."

Slow Motors (125)

Self-starting synchronous inductor motors for use with instruments, controlling devices and other applications where low speed torque or power at constant speed is needed, are described in General Electric bulletin GEA-3307.

Relays (126)

Two new 4-page bulletins by General Electric describe relays. They are GEA-3482, 3481, describing voltage relays, and plunger-type overcurrent relays respectively.

Air Cleaner (127)

Westinghouse has published a 4-page illustrated folder about the electrostatic air cleaner which is called Precipitron. The bulletin gives brief information on installation and cleaning capacity, indicates places and industries where air cleaning can save money.

Circuit Breakers (128)

Allis-Chalmers' leaflet B-6129 is devoted to 8 Trico breakers of non-oil throwing design for metal enclosed switch gear, bell, framework, or flat surface mounting, rated 2,000 amp. or less at 15,000 volts—that is, medium capacity for indoor service.

Bus Supports (129)

Delta Star Electric Co., Chicago, Ill., has recently published bulletin 31-C covering its line of unit-type indoor bus supports. Illustrations are in color and dimensional data are included.

EASY WAY TO GET INFORMATION

To keep posted, simply circle the items in which you are interested, cut out the coupon (it can be pasted on the back of a postcard) and mail to:

ELECTRICAL WEST, 68 Post St., San Francisco, California
Please send me the following CIRCLED items:

101 102 103 104 105 106 107 108 109 110 111
112 113 114 115 116 117 118 119 120 121 122
123 124 125 126 127 128 129

Name ..... Title* .....

COMPANY* .....

Address

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

THE STRONG STEEL CORE in each Copperweld wire is permanently protected by a heavy welded-on layer of pure copper — of guaranteed thickness.

Be sure to get your copy of E.D. 1678—Copperweld Overhead Ground Wires for Transmission Lines. Just write to—

Pacific Coast Representative: C. E. Ingalls, Rialto Building, San Francisco, California

COPPERWELD STEEL COMPANY · GLASSPORT, PA.

COPPERWELD

Non-Rusting OVERHEAD GROUND WIRES

ELECTRA'S HUSBAND

Let There Be Light

MAYBE it was imagination, but as Electra and I drove through street after street in the Berkeley residential district, I thought to myself that never before had the outdoor Christmas lighting been more beautiful. It was just a couple of nights before New Year's, and here for days now, lights such as these had been glowing from houses and yards in hundreds of thousands of homes from one end of the West to the other. In big cities, in little hamlets, in the yards of isolated farmsteads, draped around windows or doorways, festooned along eaves or gleaming from shrubs and trees—even palms—colored lights flickered and glowed. Where 1,940 years ago a single star heralded the birth of the Prince of Peace, today countless little colored stars commemorated that great event.

Often I have accused Electra of possessing psychic powers. Her next remark seemed to prove my contention.

"What a glorious sight!" she said. "You know my dear, this picture—along with the knowledge that it is duplicated in hundreds of other communities—gives one a deep and abiding faith in America. These blazing lights serve as a symbol that one democracy at least has not been blacked out through fear of a tyrant's hatred. Here is living proof that in one country there is still 'peace on earth, good will to men.' In other lands a brightly lighted Christmas tree would be an invitation to an enemy bomber to let loose his cargo of death and destruction. Here it means holiday feasts, toys, thrills and laughter; it means cheer for the passers-by. It symbolizes charity and faith and hope.

"If only all our people could sense this, then all of our homes would have been lighted for Christmas this year. For a time at least we might forget hatred and war and bombs and submarines; we might give thanks to Him who believed in the gospel of brotherly love. Who knows but what this might be the last time for such joyful lighting—at least for a long time to come?"

"There will never be a last time for the Christmas spirit," I interrupted. "There have been wars and plagues throughout history, yet here today there shines the Light of the World. And it will continue to shine, beckoning all and sundry to a stronger faith in the doctrine of Christ."

WE HAD been home from our ride half an hour when Electra started talking again. She interrupted my experiments with the automatic electric corn-popper I had given myself for Christmas.

"Why is it?" she queried, "that you don't ever write anything about the wives of the people in your business? I don't mean wives like myself who live in the larger cities. I'm thinking of those women who live in the smaller places where the husband is likely to be the whole power company—agent, salesman, lineman, trouble shooter and all the rest?"

"Yes, and the little woman is just as much a part of the company as her husband," I replied. "I don't have to write about them, for a chap with a small company over in Colorado has written a tribute to them. His boss sent it to me. You read it."

I handed her the piece that follows:

"It's been a tough day. You've worked darned hard trying to keep up with the day's orders, only to find at the last minute that a couple of 'must' jobs had to be done. So you grouse through them. Finally you reach home, after your supper has been warmed over several times by your loving spouse. By your perfunctory caress, she knows you are all in. Of course you miss that tired look on her face.

"So you clean up, eat your meal, and after helping with the dishes (?), you settle back with the evening paper. Just then the phone sounds off and your wife answers it (she usually contrives to be nearer to it than you are and don't ask her why). The night's run of trouble has started. This is McBeansky's restaurant. Seems they keep blowing fuses and can't find the trouble. You whistle cheerfully as off you go in the car to spend a couple of hours chasing a short. Wifey is to call you there if aught else goes blooey. Nine—ten—at eleven you climb the front steps.

"Bingo! The gentle closing of the front door starts that pleasant ringing from the black box on the wall. 'Yes, this is the Power Company. You boiled some coffee over on your range and all the lights went out? O-o-kay. I'll be right over.' You turn to the wife who ought to be in bed. 'I'll be at Cergola's on Bower Street, honey, if I'm wanted.'

"Back by eleven thirty and so to bed. But what about the Mrs.? All this nocturnal running around may be part of your job. To her it's a pain in the neck. She's just a trouble-shooter's widow. Think of that one for awhile. Maybe she, too, has had a hard day, what with the ironing, the cleaning, the answering the door, doing the thousand and one little things a woman has to do to make a house a home. Maybe her eyes burn from sewing, and she has a beaut' of a headache. Yet while you are gone, she must answer the phone, regardless of the hour. Her voice must always be pleasant, her speech courteous. Why? Because she's the Company too. You think how often you fight to keep your temper when a tough customer starts to razz. Think of the little woman in the same fix. She is as much a part of the Company as you are. On her shoulders there sometimes also rest some important responsibilities.

"So let's remember that 'they also serve' and be a bit more appreciative of our wives. We may fail to realize it, but one of the best ways we can show our gratitude is to call the wife and give her the low down when we can't get home at a stated time. Ours is a hazardous job and it causes our wives plenty of sleepless hours. Get a message to her occasionally so that she won't start worrying whether or not your insurance is paid up."

"There is a fellow a woman would really work with," Electra said as she finished reading. "Now if I had married a chap like that, I'd . . ."

"What?" I shot at her.

"Nothing," was her answer.

I READ an ad the other day about Young & Rubicam, the advertising agency. It went like this:

"A midwestern farmer, visiting a cousin in California was taken to see the San Francisco-Oakland Bridge.

" 'There,' said the proud Californian, 'is a great engineering feat—the longest bridge in the world!'

" 'Shucks,' said the farmer, 'it's nothing but a lot of little bridges strung together.' "

Moral: That's all an advertising campaign is. Or a sales story. Or life itself.

Is that so!

[FACTS ABOUT INSULATORS SELDOM DISCUSSED IN ADS, *NOT EVEN OUR OWN!*]

● Without pulling any punches, here is a frank discussion of insulator problems—*questions and answers seldom seen in print*—FREE for the asking! Corning publishes this new booklet "Plain Facts about Insulators", feeling that many facts about insulators have too long remained "untouchables"—that an informal locker room discussion is definitely in order!

"Plain Facts about Insulators" tells you the authoritative inside story about the performance of modern insulators. For instance, what happens when suspension insulators are tapped square on the pin? What happens when you shoot a suspension insulator with a .22 rifle? Why is alloy used in some designs—cement in others?

If your chief problem is insulators; if you want the truth, good and bad, about the insulators you buy and use; clip and mail the handy coupon today for your FREE copy of "Plain Facts about Insulators".

SEND FOR THIS FREE BOOKLET

MAIL COUPON TODAY!

Corning Glass Works
Insulation Division
Corning, N. Y.

Please send me my FREE copy of "Plain Facts about Insulators".

Name.....

Firm.....

Address.....

City and State.....

CORNING *means* Research in Glass

Pyrex Insulators BRAND

Some call it the "SLAUGHTERHOUSE"

By any name, it is the place where lead sheath is deliberately destroyed so that weaknesses can be noted and corrected..so that your ANACONDA CABLE will have

Longer Life

PERHAPS an even better name might be "The Life Extension Institute" for here Anaconda Wire and Cable achieve longer life and durability. Here, purposely subjected to irresistible pressures, metals fail. From studying these failures, Anaconda research men learn to make wire and cable that last longer.

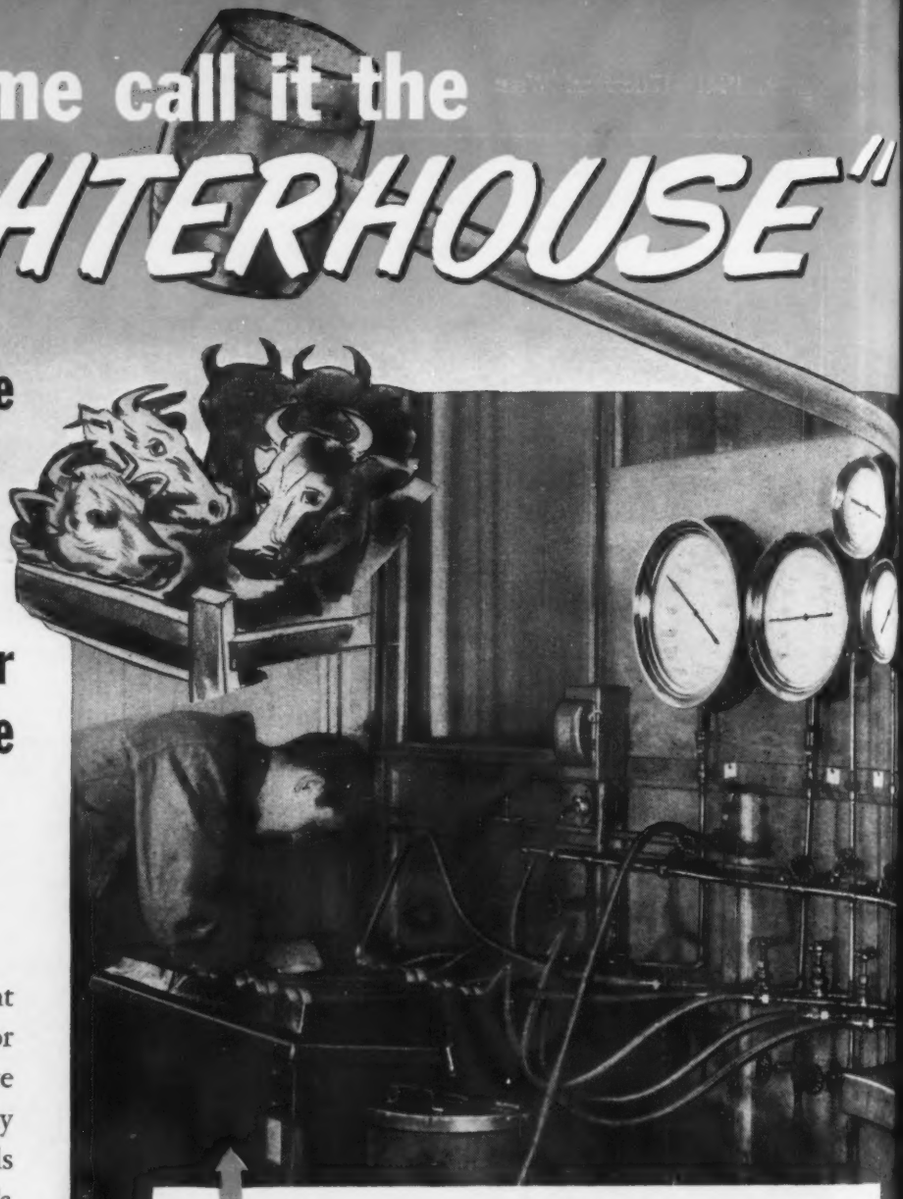
Research, painstaking and precise, is the basis of Anaconda's manufacturing control...a control that makes it possible for Anaconda to produce constantly better and more serviceable products to meet the needs and demands of American industry.

40357

ANACONDA
from mine to consumer

A Wire and Cable for Every Electrical Requirement

The Anaconda line is complete, including standard and special power cables, rubber-covered wire, magnet wire and coils. Each product has benefited from Anaconda's continuous development and research program.



This technician is putting lead sheath lengths on their death bed. They will be subjected to pressures that will ultimately break down their structure to a point of failure.

Destroyed. These are samples of lead sheath after the test. What caused them to fail and how the deficiency, if any, can be corrected is the next step in building longer life into Anaconda cables.

USE MODERN IMPROVED **Anaconda Wire & Cable**

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive

A Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

ELECTRICAL WEST

JANUARY, 1941
VOL. 86. NO. 1

Radiant Heat

Space heating by radiation requires 30% less energy input; system successful in England, Europe; could be applied in West

By F. W. Hutchinson
University of California

PUTTING electricity in a position to compete with other sources of energy as a medium for heating space; opening an avenue through which new quantities of electrical energy may be sold—these are the potentialities of a radically different system of providing heat. It is called radiant panel heating, and it has been put successfully to work in England, on the European continent and elsewhere—in a variety of climates.

Prerequisite to a discussion of radiant panel heating is an understanding of the basic difference between radiant and convective methods of heating for human comfort. The human body is a heat engine. It has a thermal efficiency of about 20%. It follows that for the body to effect the transformation of energy (metabolism), either for sustaining life or for doing external work, the body must exhaust four units of waste heat for each unit of useful work.

Human Environment

The average adult, seated and at rest, requires about 100 B.t.u. per hr. to carry on normal body functions and must therefore dispose of 400 B.t.u. per hr. of waste heat. In an environment which causes the rate of heat loss to be less than this, waste energy will be stored in the tissues, increasing body temperature and causing the occupant to feel uncomfortably warm. Conversely, if the environment permits a greater heat loss, the body must supply the excess heat from storage, thereby reducing body temperature and causing the occupant to feel uncomfortably cold.

From these facts it follows that the purpose of any system of heating or cooling for human comfort is to establish an environment such that the rate of heat loss from the body will equal but not exceed the rate at which waste heat is being produced.

In a room with air and walls at 72°F., the dissipation of normal body heat occurs as follows: radiation 45%, convection 30%, evaporation 25%. Since evaporation is practically independent of moderate changes in external conditions, it follows that convection and radiation are the only mechanisms of heat loss available to the engineer who is endeavoring to establish a comfortable environment.

The only practical method of controlling convective loss is by adjustment of the air temperature. This is the procedure adopted in all heating systems of conventional type. The essential purpose of any such system —whether using cast-iron wall radiators or circulating warm air —is to establish an air temperature which is high enough to keep heat lost from the body by convection equal to the difference between 400 B.t.u. per hr. and the uncontrolled loss by radiation and evaporation. Ordinarily this requires an indoor temperature of 72°F.

Note particularly that the object of such a system is not to supply heat to the occupants, but to establish an environment such that they will not lose heat in excessive amount. Obviously this is wasteful since it requires the input of sufficient energy to raise and maintain the temperature of the structure and of the air that it contains; none of this energy is of direct value to the occupants.

A Different Principle

The radiant system differs essentially from the convective in that it does not involve control of the air temperature and, in theory, is required to supply only enough energy to represent the difference between the actual body heat loss at the lowered air temperature and the loss which would correspond to comfort. Unlike the convective system, radiant heating is designed to supply energy directly to the occupant; such heating of surrounding structure as may occur is purely coincidental.

While the object of a radiant system is to alter only the mean surface temperature, and the object of a convective system is to alter only the air temperature, it is obvious that in practice either system will inevitably affect both air and mean wall temperatures. The point of distinction is that the radiant panel system changes the air temperature *less* than does any other system of heating or of cooling. The average panel installation establishes a comfortable environment with air temperature from 5° to 7°F. below (in winter) or above (in summer) that which is needed with heating or cooling by the conventional methods. This factor is partially responsible for the marked reduction in energy requirements which is observed with panel installations.

Although the present methods of panel heating have been developed and most widely used in the British Isles, it would be fallacious to assume that the system is applicable only in localities where the climate is similar to that of London (however, the heating range near London is comparable to that of the Pacific Coast—thus English data are directly applicable to design here) for panel installations are in use in regions where the climates are as diverse as those of Finland and Egypt.

Advantages Claimed

Among the advantages, tangible and intangible, claimed for this system in England and on the Continent are the following:

1. Architectural:

a. All portions of the heating system are completely invisible and thus do not interfere with the decorative scheme.

b. Even distribution of heating surface in the ceiling makes possible modification of partitions, etc., as in office buildings, without alteration of the heating system.

c. No loss of floor space to radiators, etc.

d. System makes possible economical utilization of electricity as a heating medium thus eliminating the need for smoke stack, fuel storage space, basement boiler room space, etc.

2. Comfort:

a. Lower air temperature results in greater feeling of "freshness."

b. Lower air temperature reduces "shock" due to entrance into or exit from a heated room.

c. Lower air temperature reduces danger of very low relative humidity which is so often associated with convective type heating systems.

3. Economy:

a. Lower air temperature reduces infiltration heat loss.

b. Smaller floor to ceiling temperature change reduces mean air temperature and thereby reduces both infiltration and transmission losses.

c. Absence of convection currents eliminates dust streaking which is associated with certain types of convective systems.

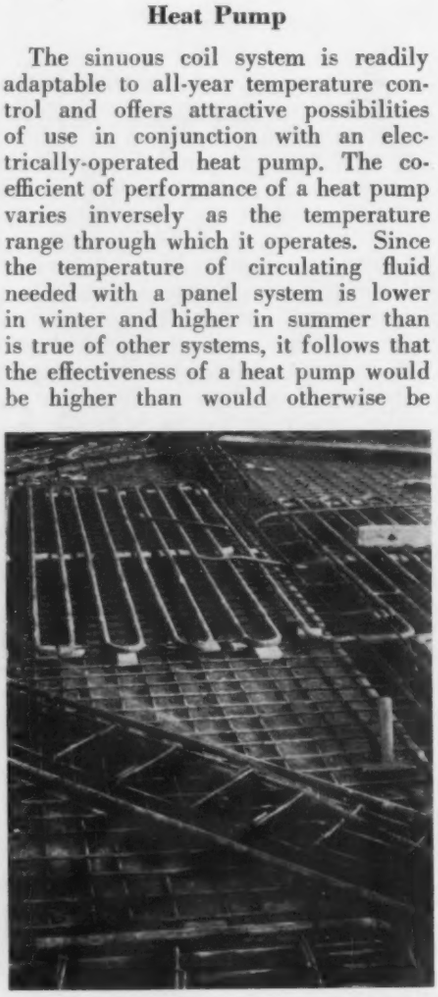
The type of system most commonly employed with electric thermal storage is "Invisible Embedded Panel Warming" (patented). It consists of sinuous coils of ½ or ¾-in. pipe placed on 6 or 8-in. centers and embedded in the structure. The standard panel is rated at 100 B.t.u. per sq. ft. of surface. Panels are distributed throughout the ceiling to give an area sufficient to supply the necessary heat and are arranged to give the greatest possible uniformity of heating effect. With this system the temperature of the circulating water is rarely permitted to exceed 110°F. and the panel designed to operate at a surface temperature of from 90° to 100°F. Control is by adjustment of the water temperature or by throttling the flow.

Outstanding as an example of sinuous coil panels with electric thermal storage is the ten-story office building of the London Passenger Transport Board. The maximum load is 3,000,000 B.t.u. per hr. and average seasonal power consumption amounts to 2,000,000 kw.-hr. Energy is converted in four immersion-heated electric boilers which are on an off-peak schedule operating between 7 p.m. and 7 a.m. Heat is stored in 16,000 gal. of water raised to 270°F., thus making available 23.000,000 B.t.u. for use during the twelve hours that the boilers are idle. The temperature of the circulating water is varied in accordance with outside conditions while individual room control is obtained by throttling the flow.

It has been estimated that the energy necessary to heat this building with a conventional system would be 35% more than is now needed, and the contractor responsible for this installation will give an unqualified guarantee that a system of this type will operate with at least 30% less energy than would be needed by a conventional heating plant.

Heat Pump

The sinuous coil system is readily adaptable to all-year temperature control and offers attractive possibilities of use in conjunction with an electrically-operated heat pump. The coefficient of performance of a heat pump varies inversely as the temperature range through which it operates. Since the temperature of circulating fluid needed with a panel system is lower in winter and higher in summer than is true of other systems, it follows that the effectiveness of a heat pump would be higher than would otherwise be possible. To the writer's knowledge no heat pump installations have yet been made in conjunction with panels, but summer cooling by the panel system is in successful operation.



Floor-warming sinuous coil panels being installed during construction of building

Boiler

The electric boiler used with a thermal storage system is usually of the immersion heated type when the load is less than 200—400 kw.; for greater loads electrode boilers operating at 6,500 or 11,000 volts are used. Control of the electrode unit is by adjustment of insulated sleeves surrounding the electrode; extending the sleeves reduces the average path between electrodes, correspondingly reduces resistance.

Cost data on thermal storage installations are not plentiful, but based on English experience it would seem safe to say that a moderate sized sinuous coil heating system with electric thermal storage could be installed complete (in England) for approximately $65 per kw. It is not possible to correct this figure for direct use in estimating for an American installation. All available data confirm the claim that panel heating is lower in operating cost.

For electric heating, the energy requirements of a thermal storage system must always be greater than the requirements of a direct resistance panel system. The only justification for an indirect electric system is that it permits taking advantage of off-peak rates, or permits converting a fuel-fired heating plant to electricity.

The first cost of a thermal storage plant is much greater, for a small installation, than that of a direct resistance panel system, but as the size increases the advantage of the direct system decreases. On the basis of experience abroad, 200 kw. would seem to be an approximate division point.

Direct electric panel installations are of three types and can most conveniently be classified as high-, medium- and low-temperature systems.

Units of the high-temperature system are limited to small portable panels and find widest application as a means of establishing local zones of comfort in large rooms or in rooms having unusually high ventilation rates. They are designed for loads of 250 to 500 watts per sq. ft. and are available in sizes up to 1,250 watts. Normal surface temperatures are from 300° to 600°F. The units are suspended from the ceiling and should only be used in structures which permit placing them at least 10 ft. above the heads of the occupants.

Medium-temperature units are of cast iron or sheet metal with built-in resistance wiring. The design load varies from 70 to 180 watts per sq. ft. and the corresponding surface temperatures are from 150° to 250°F. The panels are detachable and, like the high-temperature type, are best suited for local heating.

Low-temperature panels have an 18 watt per sq. ft. load and operate with a surface temperature less than 100°F. They are intended for permanent installation as part of the structure. One form of low-temperature panel consists of plasterboard backed with aluminum foil and with resistance wires between foil and board.

Fabric System

Another form of low-temperature system, which has been used in 150 installations (including the first cla

lounge on the liner Queen Mary), is a patented, flexible dielectric fabric 1/16-in. thick with nickel-copper resistance wires embedded at regular intervals. It is sold under the trade name "Dulrae" and is available in rolls 20 or 40 in. wide and of length up to 100 yards. A coiled resistance wire is connected across stranded copper bus bars at intervals of 2 ft. along the length of the 40-in. material. Each wire therefore heats a section 24x40-in., and the fabric can be cut to any length which is a multiple of 2 ft.

The recommended method of installation is to place the fabric between layers of ¼-in. plaster board backed by 2 in. of insulation. The exterior board insures transfer of the heat to all parts of the panel surface and prevents the dust streaks which might occur if the surface temperature were not uniform. In most cases the heated sections of the ceiling are finished uniformly with the rest of the ceiling by application of a good quality wall paper.

The many existing installations (the largest is 300 kw.) include office buildings, stores, residences and public buildings.

American Research

Electric radiant heating has been finding an ever widening field of application in Europe. The number of such applications is already sufficiently great to establish the practicability of the system and to demonstrate that it offers an opportunity for development of a new market for electrical energy.

In the United States, it has been slow in developing, but at present a number of universities are at work on research. Among these are the University of California, where, under the direction of Professor B. F. Raber, a comprehensive research project is under way to collect data on the costs and performance of the radiant system for both heating and cooling. This latter project is now working with a "Dulrae" heated test room, and it is hoped that an opportunity will be afforded to extend the work to include thermal storage. The results of such research may prove of value to the electrical industry at large.

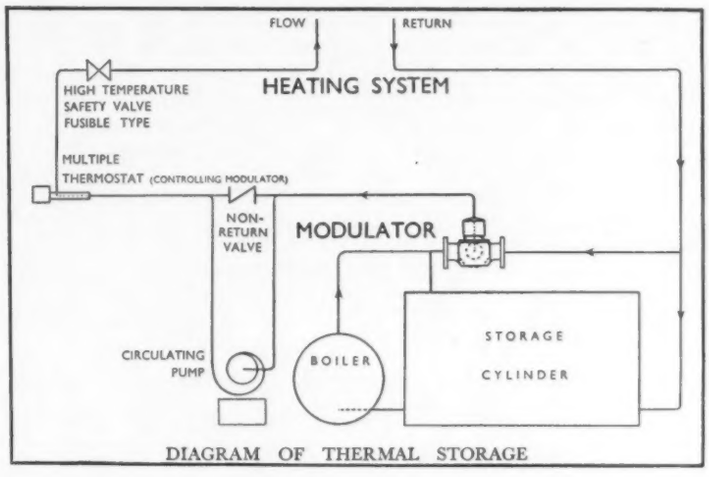
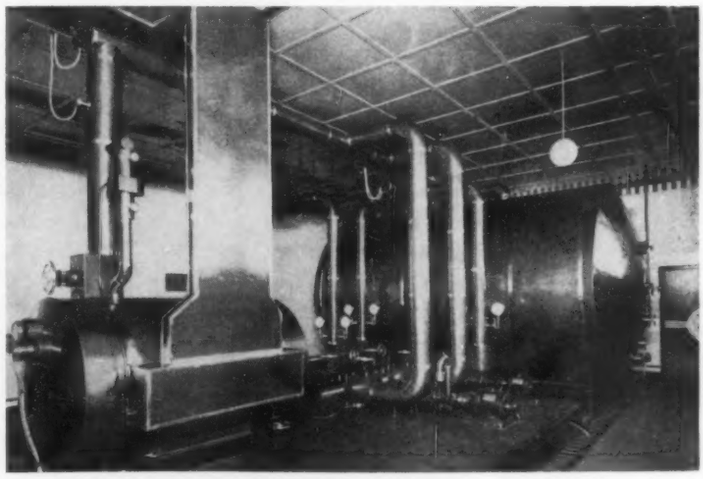


DIAGRAM OF THERMAL STORAGE



TOP—London's Passenger Board building, panel heated, uses 2,000,000 kw.-hr. per year., off-peak

MIDDLE—Thermal storage takes advantage of off-peak rates. Part of the return water is stored

BOTTOM—This is a typical thermal storage plant, exemplifying the cleanliness of electric heating

Ground Resistance

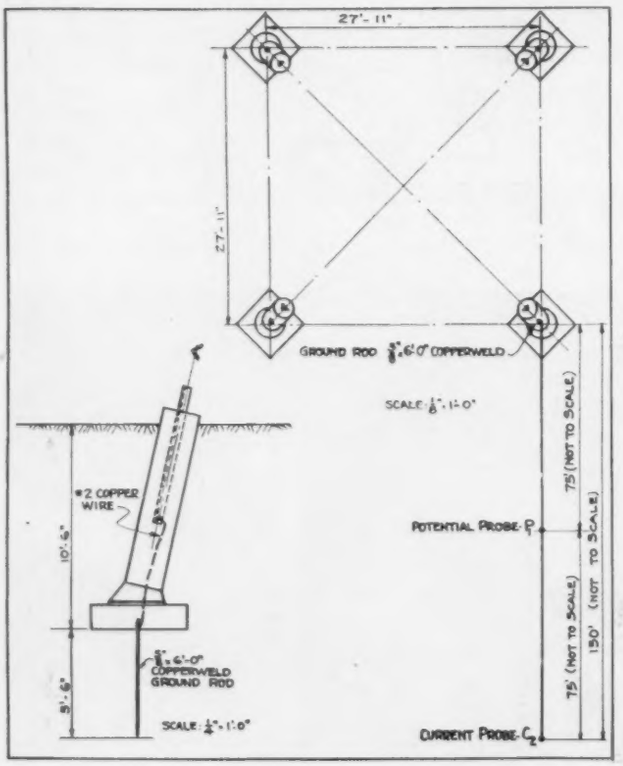
Details of extensive tests on Skagit transmission line form basis for estimating ground resistance, particularly in Northwest soils; test results are compared with theory and data from other sources

ADEQUATE grounding of transmission line towers is necessary to make effective the various schemes of lightning protection and to prevent unduly high potential gradient in the surface of the ground in the vicinity of the tower when it is subjected to lightning strokes or electrical flashover. There is to be found in the engineering literature a vast quantity of material dealing with the theoretical aspects of grounding systems and their relative efficiency. On account of the extreme variation in resistivity of soils in different localities, together with many other variables not readily evaluated, it is easy to understand why such discussions must be limited largely to relative values not affected by specific resistance. It is the purpose of this paper to compare theoretical considerations with the results of tests actually made in the field and to make available for future reference the results of more than fifteen hundred ground resistance measurements taken during the construction of the City of Seattle's Skagit transmission line No. 2.

General Description

Skagit transmission line No. 2 is a double circuit, 240-kv., steel-tower line of conventional design. The line being located in an area relatively free from lightning disturbances, no ground wire was installed except at the ends approaching the switching stations. However, provision has been made for future installation of the ground wire should operating experience indicate that this be required. The tower foundations of reinforced concrete are of the pad and pedestal type, buried to a depth of approximately ten feet.

Fig. 1—Scheme of tower grounding and test arrangement



Tower Grounding

The standard tower ground consists of four ⅝-in. by 6-ft. Copperweld ground rods, one placed at the center of each tower leg foundation, thus distributing the rods to get good electrical efficiency and at the same time permitting their being driven at the bottom of the excavations. By driving them in this manner the point of the rod penetrated to a depth of 16 ft. below the surface, insuring their being always in moist soil. This results in a minimum seasonal variation of good resistance. All connections are buried in concrete to prevent tampering or theft.

In rock foundations the rods were driven along the surface of the rock if the overburden exceeded 4 ft., or in cracks in the rock where conditions were such as to indicate that reasonably low resistances might be obtained in this manner.

The general grounding scheme is shown in Fig. 1, together with the standard arrangement of auxiliary grounds or probes used for test purposes.

Method of Measuring

Ground resistance measurements were made on individual footings and on the completed tower after erection. Measurements were made by use of a ground ohmer. Auxiliary grounds were of ⅞-in. hexagonal tool steel, 3 ft. long. These probes gave generally satisfactory results though it was sometimes necessary in dry weather to wet the ground in the vicinity of the probe before sufficient sensitivity was secured to give reliable results. In addition to measurements made before and after erection, measurements were made on a large number of towers in the late summer and late winter to determine the magnitude of the seasonal variation of ground resistance.

Ground Resistance Curves

In order to determine the minimum distance at which auxiliary grounds could be driven without seriously affecting the accuracy of the results, a series of tests were made at various probe spacings. Distributed grounds such as the tower grounds usually require greater probe distances than permissible when testing single, isolated ground rods.[1] Fig. 2 is the relation between probe spacing and measured resistance for a tower having a resistance of 3.1 ohms and shows that, within the limits of the test, accurate values of tower footing resistance may be obtained if the potential probe, P_1, is placed midway between the auxiliary current probe, C_2, and the ground being measured. These curves also show that the closer C_2 is to the ground under test

By H. V. Strandberg

Seattle City Light

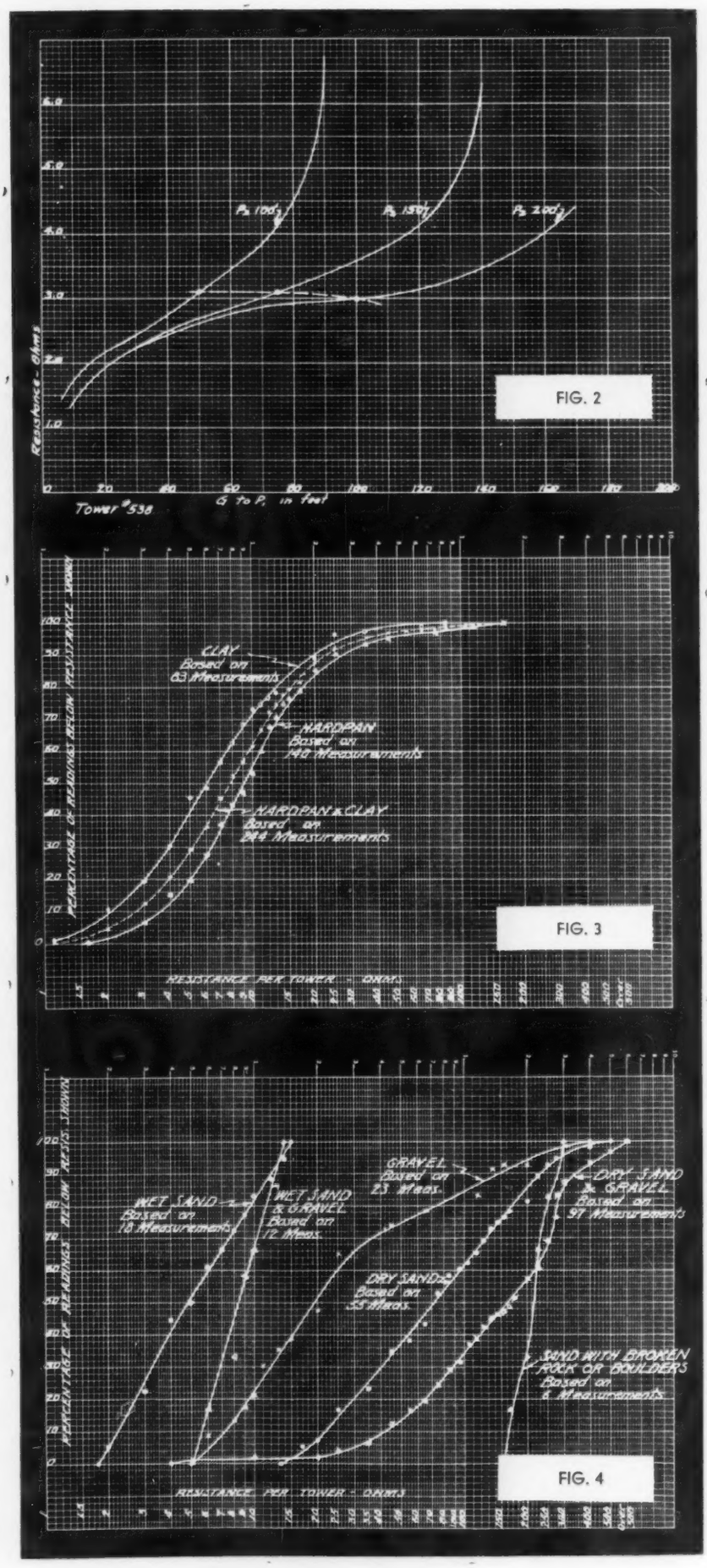
the more care must be used in placing the potential probe at the exact midpoint. It was for this reason that in all tower ground resistance tests, probe distances of 75 and 150 ft. were used. Leads of this length were not inconveniently long to handle and yet permitted minor variations in probe spacing as required by field conditions without seriously affecting the results obtained.

Tests have also borne out theory in showing that much shorter probe distances are permissible when measuring the resistance of a single ground rod than when measuring that of a distributed ground such as that of a transmission tower consisting of four rods driven at the corners of a 28-ft. square.

Ground Rod Efficiency

The resistance to ground of a single ground rod in a group of parallel connected rods closely spaced is higher than that of an isolated rod, due to the effect of adjacent rods on the current distribution about the rod under consideration. By substituting for the ground rods equivalent half-buried spheres, the magnitude of this effect was calculated by use of comparatively simple formulas[2] with sufficient accuracy for the purpose.

In computing the diameter of the equivalent sphere, it was assumed that the ground rod was 16 ft. long, extending to the surface of the ground, in order to allow for the conductivity of the damp concrete which was found to be of approximately the same magnitude as that of the soils encountered, and that the rod was 5/8-in. diameter throughout. The validity of this assumption seemed to be borne out by tests made before and after pouring concrete. With these assumptions applied to the layout of Fig. 1, the ratio of the resistance to ground of an isolated rod to that of a rod in the group was calculated to be 0.813. A check of the calculated value of this ratio was obtained by measuring individual footing resistances and the resistance of four footings connected in parallel, at 86 tower



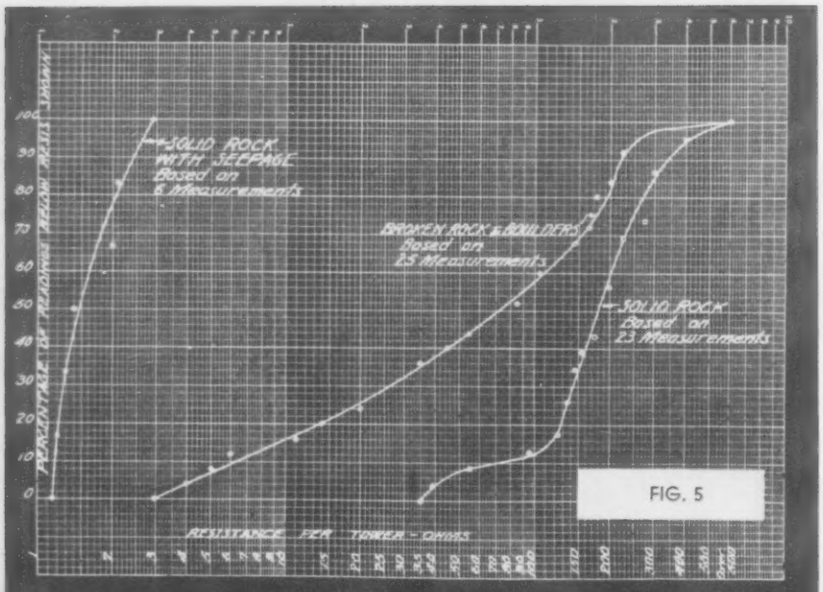


FIG. 5

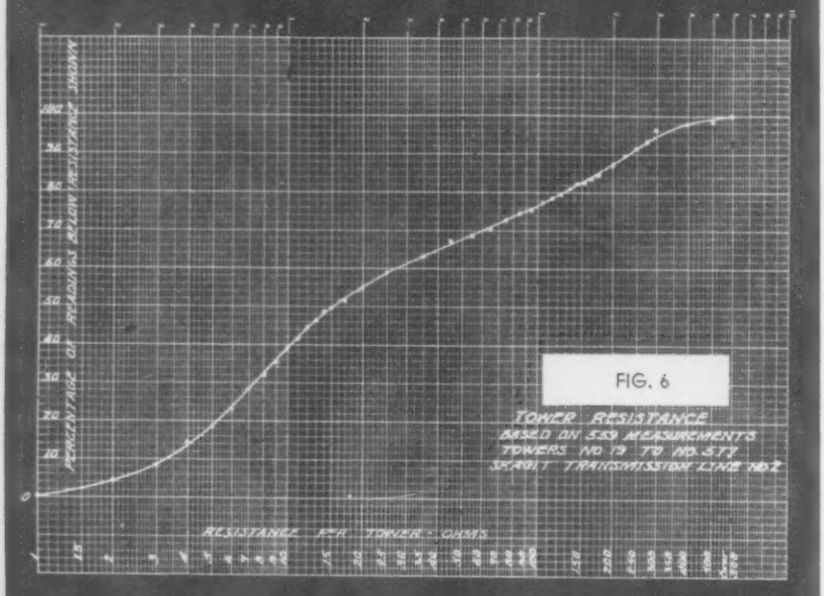

TOWER RESISTANCE
BASED ON 553 MEASUREMENTS
TOWERS NO 19 TO NO 577
SEARLE TRANSMISSION LINE NO 2
RESISTANCE PER TOWER - OHMS

FIG. 6

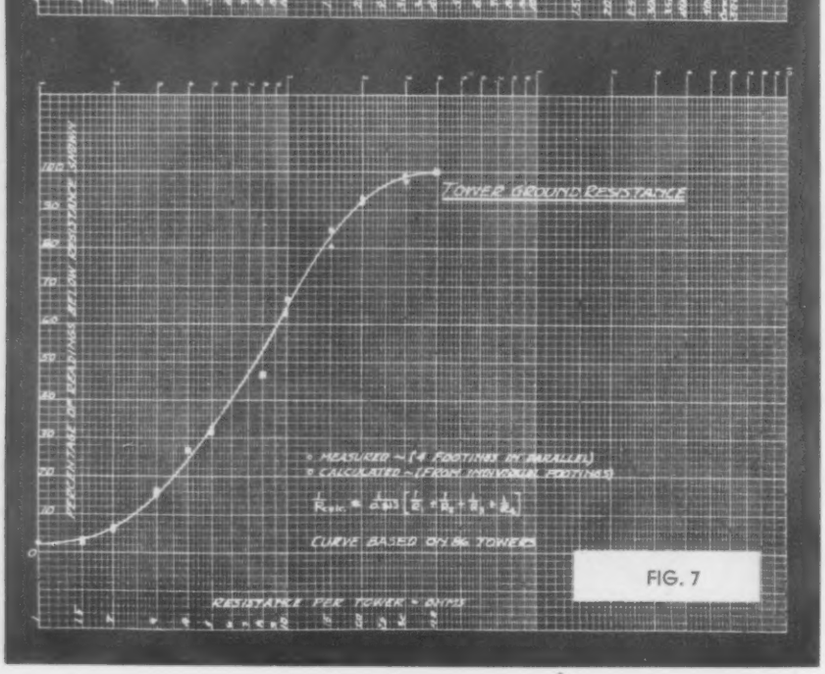

TOWER GROUND RESISTANCE
= MEASURED - (4 FOOTINGS IN PARALLEL)
= CALCULATED - (FROM INDIVIDUAL FOOTINGS)
CURVE BASED ON 84 TOWERS
RESISTANCE PER TOWER - OHMS

FIG. 7

sites. The resistance of the four footings in parallel was computed from the resistance of individual footings considered to be isolated. The average value of the tower ground resistance computed in this manner was found to be 7.59 ohms, compared to an average measured value of 9.69 ohms, a ratio of 0.795, which is in close agreement with the calculated value of 0.813, as shown in Fig. 7.

Excavation Records

A card record was kept of the type of material excavated from each tower footing. Material was classified by visual examination as shown in Table I, the classification being indicated by letter on a vertical scale indicating depth below the surface and a horizontal line at the appropriate elevation indicating the dividing line between classifications. No attempt was made to secure an accurately technical description of the soils encountered, though somewhat detailed notes were made where material of unusual character was found. The record also indicated whether the excavated material was wet or dry. Wet, as used in the excavation reports, indicated flowing water.

Soil Classification

Soils encountered in any large area are seldom of sufficient uniformity to permit accurate representation of their physical properties. Tests on grounds driven in apparently identical soils will vary greatly in resistivity. However, the presence of sand, gravel, clay and hardpan with quite uniform characteristics, together with a large number of resistance measurements, prompts the attempt to analyze these data and correlate ground resistance with soil types.

In dealing with data of this kind no sharp demarcation between soil classifications can be expected, since the soil constituents are found in varying proportions, and in probably ten percent of the cases it is difficult to decide in which classification the soil belongs. Variation in moisture and mineral content introduces variables which cannot be readily evaluated. However, from the large amount of data available it was possible to prepare curves which, when interpreted in the light of the field notes, would give a ready means of estimating the ground resistance of other installations in similar soils.

Clay and Hardpan

Clay and hardpan were found to give resistance values of approximately the same magnitude. The curves of Fig. 3 are the result of 83 tower ground resistance measurements in clay, 140 in hardpan, and 21 in various combinations of the two. Resistance under three ohms was found to be in locations

where the soil was saturated, usually with seepage from overburden containing much decayed vegetation, or in pastures and similar locations. Values over 15 ohms usually were found where the soil was noted to be dry. During the course of the work similar curves were plotted for groups of towers in widely separated districts. These curves generally fell within reasonable limits of the curves of Fig. 3, indicating that the curves are generally representative of soils of this type.

Sand and Gravel

The curves of Fig. 4 show the resistance of sand and gravel under various conditions. The curves for gravel, wet sand and wet gravel, were prepared from too few readings to be subject to general interpretation, but are here given to illustrate the wide variation in resistance to be expected in material of this character. Sand and gravel as herein classified contain varying quantities of clay and loam. Sand and gravel were generally encountered on bench lands in the Sauk and Skagit river valleys, and were found to be comparatively dry the year around because of their porous character. High ground resistance was therefore to be expected.

Resistance in Rock

Where rock was found the ground rods were driven along its surface if the overburden exceeded four feet in depth, or in cracks in the rock when indications were that satisfactory results could be obtained in this manner. The results obtained are shown in the curves of Fig. 5.

Much of the rock contains high percentages of talc which generally gave satisfactory grounds, especially if seepage was encountered. In other rock and boulders with varying amounts of overburden and moisture content, there was a wide range of resistances varying from three to over 500 ohms, most readings falling between 100 and 300 ohms.

Seasonal Changes

By driving the ground rods from the bottom of the foundation excavations the greatest possible depth was obtained with a comparatively short rod. With but few exceptions all rods so located were embedded in permanently moist soils. Where satisfactory grounding conditions were found, little seasonal variation in tower ground resistance was anticipated. Where sand, gravel and boulders, and rock were encountered, a wide seasonal variation was expected and subsequent tests confirmed this conclusion.

In order to determine the magnitude of the seasonal variation resistance measurements were made at a number of locations covering a range of ground resistance representative of the entire line. These measurements were made in September, the end of the dry season, and in March, near the end of the wet season. As expected, little seasonal change was discovered in grounds set in loam, clay, hardpan, and permanently moist sand and gravel. Where grounds were set in rock, boulders or gravel benches with good drainage, a great seasonal change was found amounting in many cases to several hundred percent.

Soil Resistivity

The soil resistivity may be computed from the measured ground resistance by means of well known formulas[2], relating the physical dimension of the grounding system and its resistance. By use of the soil resistivity so computed, the resistance of other arrangements of grounds may be derived.

Comparison with Published Data

The U. S. Bureau of Standards' Technologic Paper No. 108 gives assembled data on ground resistance in many parts of the United States. A complete description of the grounds is not given, so direct comparison is not possible. The data are summarized in Table II.

The values in parenthesis are the corresponding computed resistances of four rods in parallel. Referring to Figs. 3, 4 and 5, it will be seen that these approximate values obtained from the curves for corresponding soils.

Conclusions

Soil classifications, grounding system, and test procedure have been described in considerable detail in order that the results of ground tests given in the form of curves may be properly interpreted. The use of the data herein presented, together with other published information, will make possible a reasonably close estimate of the ground resistance of ground systems installed in similar soils, especially in the Puget Sound region.

Table I—Soil Classifications

a. Loam
Fine sands and clays containing a varying amount of decayed vegetable matter. This classification included material which might be more properly classified as silt, but which was encountered in relatively few foundations.

b. Sand
Water deposited material relatively free from clay and vegetable matter.

c. Gravel
Water deposited material containing relatively little clay and vegetable matter, and therefore very porous.

d. Boulders, one foot and larger
This classification was used in conjunction with sand and gravel to indicate more accurately the type of material excavated.

e. Clay
In every case where encountered this is the so-called blue clay, with a sufficiently high water content to make it tenacious and plastic.

f. Hardpan
Fine sand, clay, and varying percentages of gravel, highly consolidated and impervious to water, which may be excavated with a power shovel without blasting, but with difficulty.

g. Broken Rock
Angular rock in large fragments with or without filler material, usually encountered in talus slopes.

h. Solid Rock
This classification is primarily of granites, shales, talc and sandstones.

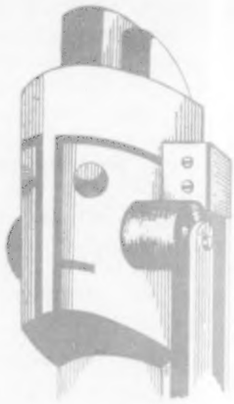
REFERENCES

1. Ground Resistance Testing. Technical Bulletin No. 1285. James G. Biddle Co.
2. Calculation of Resistances of Grounds. H. B. Dwight, Electrical Engineering, Dec. 1936, pp. 1319 to 1328.
3. Ground Connections for Electrical Systems. Technologic Paper No. 108, U. S. Bureau of Standards.

Table II—U.S.B.S. Ground Resistance Data

Material	Maximum Resistance	Minimum Resistance	Average Resistance
Fills and ground containing more or less refuse such as ashes, cinders and brine waste	41 (12.6)	3.5 (1.1)	14 (4.3)
Clay, shale, adobe, gumbo, loam and slightly sandy loam with no stones or gravel	98 (30.2)	2 (0.6)	24 (7.4)
Clay, adobe, gumbo and loam mixed with varying proportions of sand, gravel and stones	800 (246)	6 (1.8)	93 (28.6)
Gravel, sand and stones with little or no clay or loam	2700 (830)	35 (10.8)	554 (170)

ABC'S of Relays



Part 6—Carrier-current relaying. For safety and continuity, simultaneous opening of breakers at each end of a line is often necessary. Carrier makes it possible

By E. B. Kipp
Westinghouse
Los Angeles

THE high-speed impedance (distance) relaying scheme approaches the ideal but falls short of this goal in that it does not provide instantaneous clearance of faults over the entire associated line section. Part 5 of this series told why it was usually necessary to limit the instantaneous-operation coverage of the impedance relays to about 90% of the line section but the following illustration will describe this action more fully.

The section of line (Fig. 1) represents part of a loop transmission system. Circuit-breakers at substations "A" and "B" are tripped by high-speed impedance relays set to operate for faults with power-flow shown by the arrows. The relays at "A" are set to operate instantly for faults between "A" and "Y" and those at "B" operate instantly for faults between "B" and "X." Any fault between "X" and "Y" will therefore cause instantaneous and simultaneous tripping of circuit-breakers at both "A" and "B." A fault between "B" and "Y" will be cleared immediately by operation of the first impedance elements at "B" but since it is beyond the range of the first impedance elements of the "A" relays a short time delay will be introduced by the action of the second elements. Similarly a fault between "A" and "X" will not be cleared immediately by the "B" relays.

However, from the standpoint of system stability, continuity of service, quick reclosing and minimum damage to equipment, it is extremely desirable that the breakers at each end of the line section be tripped simultaneously.

By the use of carrier current it is possible instantly to compare conditions at the two ends of a line section and operate both circuit breakers simultaneously for faults anywhere within the section.

Fundamentally, carrier current is nothing more than a high-frequency current super-imposed on a power-transmission line for the transmission of signals from one end of a line section to the other. It may be thought of as a radio signal which is confined to the path of the transmission line instead of being broadcast through space.

A typical carrier-current relaying equipment for the protection of a line section includes (at each end) a simple radio transmitter-receiver, a line-tuning unit, a high-voltage coupling-capacitor for coupling the radio equipment to the line, a tuned wave-trap for confining the signal to the line-section, a sensitive receiver-operated relay and a set of "fault-detector" high-speed impedance relays which initiate operation of the carrier set.

Carrier Equipment

The carrier-current transmitter-receiver is in many respects similar to radio communication equipment. However, since its only function is to send and receive a tuned radio signal it is made as simple as possible to insure the greatest reliability with the least maintenance. A transmitter may employ a simple one-tube oscillator circuit to generate the high-frequency signal and a two or more tube power amplifier having an output between 15 and 40 watts depending upon the design. The oscillator can be tuned to any frequency between 50 and 150 kilocycles. This frequency band is used because lower frequencies may interfere with communication on adjacent telephone lines and higher frequencies increase radiation with a consequent loss of signal strength. For comparison, the ordinary broadcast range is 540 to 1500 kilocycles. The receiver is also a simple unit which can readily be tuned to the frequency of its associated transmitters.

The transmitter-receiver equipment is generally mounted in a weather-proof cabinet near the coupling-capacitor.

The line-tuning unit (also mounted in the cabinet and connected between the carrier set and the coupling-capacitor) consists of a tapped inductance coil and condenser and serves to tune the transmission line to the desired carrier frequency. A small milliammeter connected in the output lead facilitates tuning to obtain the maximum signal strength.

The carrier-sets may be dc or ac operated depending upon the designs. In either case it is customary to operate them directly or indirectly from the station battery because the source of power must be absolutely dependable. The new dc carrier sets operate directly from either a 125- or 250-volt battery, but the older ac sets require a small dynamometer which converts the battery current to 60-cycle ac. The dynamometers are generally used at each station (one as a spare) with automatic throw-over switches which transfer the carrier sets to the spare unit in case the first unit fails.

Since it is obviously impractical to connect the carrier sets directly to the high-voltage transmission line conductors, the connection is made through coupling capacitors. In some cases the carrier frequency is impressed between one phase and ground and in others between any two phases. The phase-to-ground channel requires only one coupling capacitor at each end of a line section (the phase-to-phase channel requires two) but the attenuation (loss in signal strength) is two or more times that of the phase-to-phase connection.

Coupling Capacitors

Coupling capacitors are essentially high-voltage condenser units mounted in a weather-proof porcelain housing and connected to ground through a drainage coil and radio-frequency choke coil. The physical size of the coupling capacitor is governed by the transmission line voltage but in general the units have somewhat the same size and appearance as lightning arrestors of the same voltage rating. The carrier set is connected across the terminals of the radio-frequency choke coil and is thus at a low voltage to ground.

The high-voltage condenser unit (.001 to .002 mfd.) offers a very high impedance (several million ohms) to the flow of 60-cycle power current to ground

but forms a relatively low impedance path for the high-frequency carrier current. Conversely, the radio-frequency choke forms a low-impedance path for the 60-cycle current but offers a high impedance to the flow of carrier current. Thus, in effect, the carrier-current is impressed directly on the transmission-line conductor. By the addition of a few small condensers and reactors it is also possible to use the coupling capacitor as a potential source for the impedance relays.

Selectivity

To secure the proper selectivity between relays on a transmission system each line-section is assigned to a different carrier frequency to eliminate interference between sections. All receivers and transmitters on any one line section are tuned to the same frequency so that either receiver may receive a signal from its own transmitter or from the one at the other end of the line. To confine the carrier-current to its own line section, resonant choke coils known as "wave-traps" are used at the ends of each conductor to which the carrier equipment is coupled. The wave-traps are quite similar to the old-fashioned spirally-wound choke coils except for the addition of a multi-range capacitor and a lightning arrestor which are mounted inside and connected across the terminals of the coil. The impedance or choking effect of the wave-trap to the 60-cycle power current is practically zero, but by means of the multi-range capacitor the trap can be tuned to present a very high impedance to the carrier frequency. This effectively confines the carrier-current to its own line section and at the same time prevents faults on adjacent sections from interfering with the carrier transmission on the good line sections. The lightning arrestor prevents damage to the capacitor from lightning or switching surges by allowing the surges to by-pass the wave-trap.

The correct operation of the carrier current is not affected by transmission line faults because during fault conditions the signal is transmitted over only the good line-sections to block the relays from tripping.

The fault-detecting relays which control the carrier sets are usually of the high-speed impedance type (fundamentally the same as those used in step-type distance relaying). In addition, the carrier scheme requires a carrier-current auxiliary relay and a directional over-current ground relay.

The first elements of the impedence relays are set for about 90 percent of the line section, the second for about 150 percent, and the third are given a long-distance setting to provide "back-up" protection. The third element contacts in series with the directional contacts effect the carrier-current signal at each end and also operate as regular distance elements with a time delay to give back-up protection in case other relays fail to operate. The second-element contacts are in series with the directional contacts and the first set of synchronous timer-contacts. When the second element and the directional contacts are both closed the timer contacts are short-circuited, the carrier is stopped at that end and the trip circuit is completed immediately provided no carrier signal is received from the other end. The first element operates independently of the carrier current and completes the trip-circuit directly if the directional contacts are also closed—that is, if the fault power-flow is in the right direction.

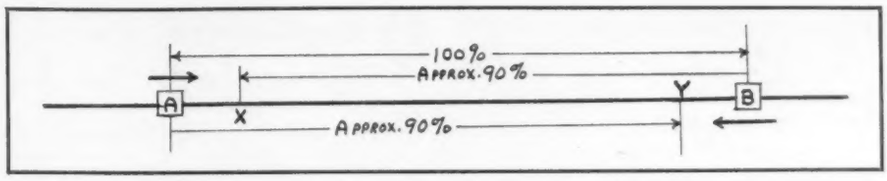


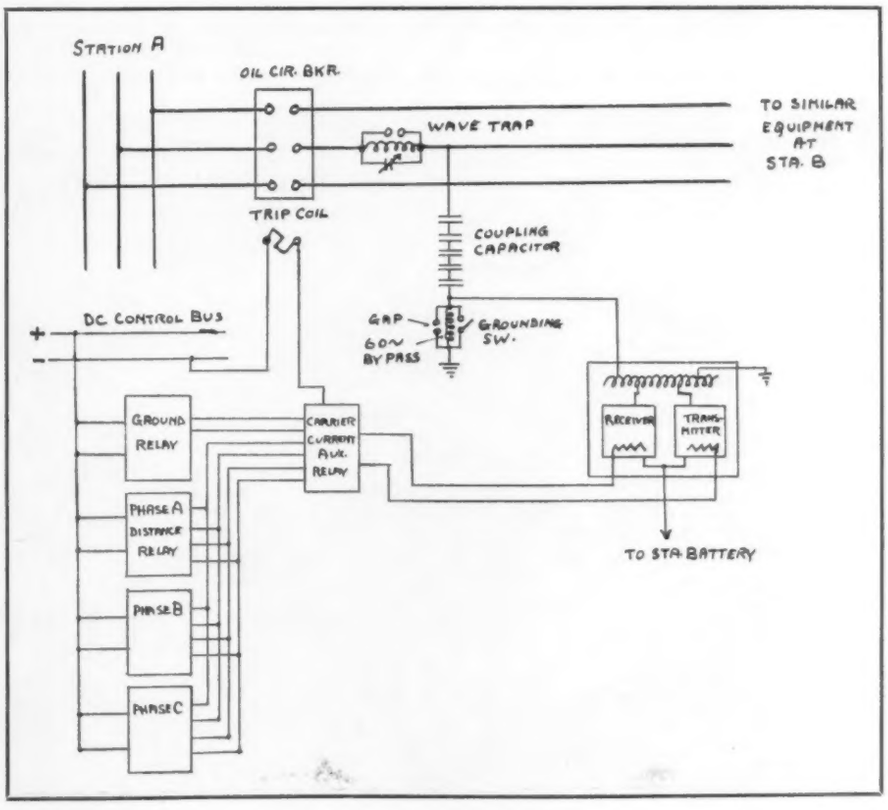
Fig. 1—Schematic line section, representing part of a loop transmission system.

The carrier-current auxiliary relay is a combination of elements including a sensitive carrier-current-operated relay, an alarm relay, and a directional auxiliary relay. The function of this relay is to block or prevent instantaneous tripping for faults external to the line section and to permit instantaneous tripping for internal faults. In addition, during ground faults, it automatically gives the ground relays preference so they can control the carrier-transmitter and prevent false operations during heavy phase-to-ground faults in adjacent sections.

The directional over-current ground relay has a high-speed directional element and two instantaneous over-current elements which are set at a low value to operate definitely for all ground faults within the section. One of the over-current elements starts carrier but when the contacts of the other and the directional contacts are both closed the carrier is stopped at that end and the trip circuit is completed provided no signal is being transmitted from the other end.

The action of the complete carrier-current relaying scheme can be illus-

Fig. 2—Schematic diagram of typical carrier current relay equipment (control only)



trated by considering the following cases.

Referring again to Fig. 1, for a phase-to-phase fault between "X" and "Y," all three impedance elements at each end will operate, but the contacts of the first impedance and the directional elements will trip the circuit breakers at both ends simultaneously and independently of the carrier equipment. If the fault is beyond the zone of the first element of one set of relays, then the carrier current comes into action. For example, if the fault is between "Y" and "B", only the second and third elements of "A" relays can operate. Carrier is initiated at the back end of the line by the third elements, but the second element contacts in series with the directional contacts at the "A" end stops carrier and completes the trip circuit since a similar action has occurred at the other end of the line section.

If the fault occurs outside the line section, for instance to the right of "B", the impedance and directional contacts of "A" will close and no carrier current will be transmitted from that end. But the directional contacts at "B" will be open and the impedance contacts will close to transmit a carrier-signal which prevents either "A" or "B" relays from tripping.

The ground relays operate in a similar manner to prevent tripping unless the ground fault is definitely within the line section.

Floating Power Plants

Floating electric light and power plants, each of which would supply a city of more than 200,000 population, probably will be built to provide emergency power to Pacific Coast industries in the event that present plants are damaged by sabotage and bombings in war.

This was disclosed last month when plans were announced for a 50,000-kw. steam-generating station that would be housed in a 290-ft.-long boat. A. P. Kellogg, General Electric scientist, asserted that a "large portion of the West Coast and Eastern United States could be reached by power-plant vessels designed to be towed through harbors, lakes and rivers."

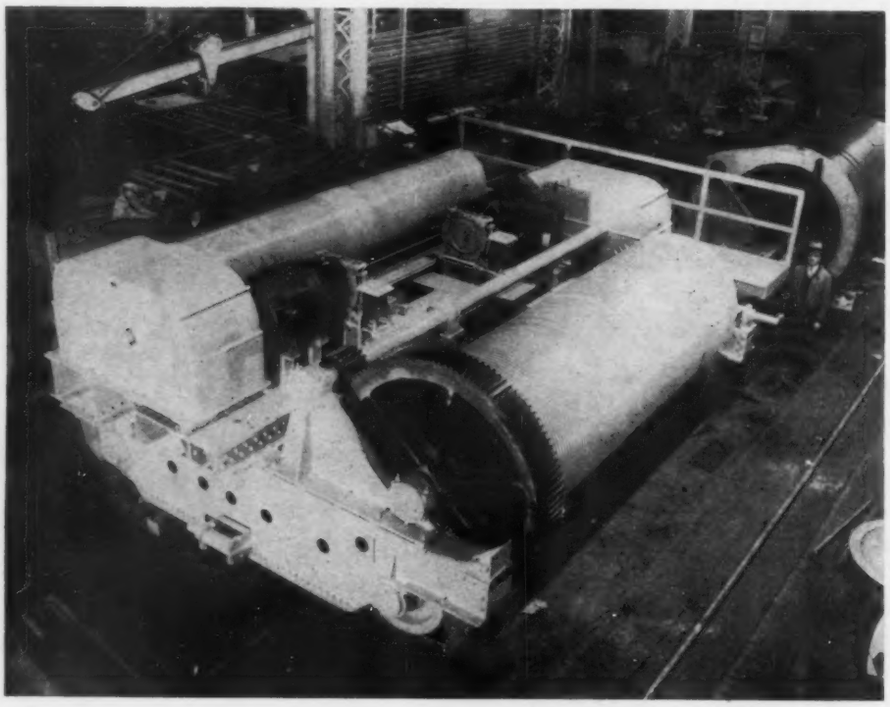
Not only coastal cities, but also the majority of all the largest inland cities could be given emergency service by such floating power plants, it was pointed out by Prof. Royal W. Sorensen of California Institute of Technology, president-elect of AIEE.

New Use for Eddies

A new type of equipment for locating surface or submerged flaws in nonmagnetic metal parts was described to the American Society of Mechanical Engineers at their December annual meeting in New York. The development was announced by Ross Gunn, technical adviser and superintendent of the Division of Mechanics and Electricity, U. S. Naval Research Laboratory, Anacostia, D. C.

It detects flaws by inducing a predetermined pattern of electrical eddy currents in a perfect test sample of the metal part to be inspected, by the use of alternating magnetic fields. Sensitive pick-up coils properly disposed in relation to the eddy currents measure in any similar part being tested only the departures of the eddy-current pattern from the pattern in the perfect sample.

175-TON LIFTING CAPACITY is provided by this trolley, one of four (two per bridge) built by Whiting Corp. for Grand Coulee. Main hoist drum has 5-ft. diameter. Two larger cranes will work in conjunction to lift the 625-ton rotors



● "WHO'S WHO IN ENGINEERING," fifth edition, is now being prepared. Compilation is going forward in New York under the editorship of Dr. W. S. Downs, qualifications for listing being established by a committee of the engineering profession consisting of representatives of prominent universities, engineering societies, etc.

● HUNTING ELECTROLYSIS. Good results have attended experiments under way in the water supply system of the East Bay Municipal Utility District with a new method for locating points on the system where electrolysis occurs. The instrument used is a vertical magnetometer on which readings are taken of current intensity in a vertical plane. Observations are made at intervals of about one-half mile along a pipe line near which a cathodic charge has been put into the ground (thus creating a tendency for flow from ground to the pipe rather than the reverse.) If the gammas, as indicated by readings at successive stations, do not show a uniform decrement, the location of abnormal flow is marked for more accurate exploration.

● A 2,500-KVA. POWER RECTIFIER for the oscillator of the University of California's cyclotron will be furnished by General Electric. The equipment is to be supplied at 12,000 volts, 3-phase, 60 cycle and will feed at 25,000 volts, direct constant current to the oscillator of the cyclotron, operating at 10 million cycles.

● SUNSET SUBSTATION on the southwest edge of Spokane is in service. Receiving power from Long Lake and Littlefalls generators, Sunset substation is a major unit in a $300,000-program which includes constructing 8 mi. of 110-kv. line around Spokane's south side. According to B. M. Merrill, manager of Washington Water Power's power supply department, the project was started last spring and will continue well into this year.

Five and Dime

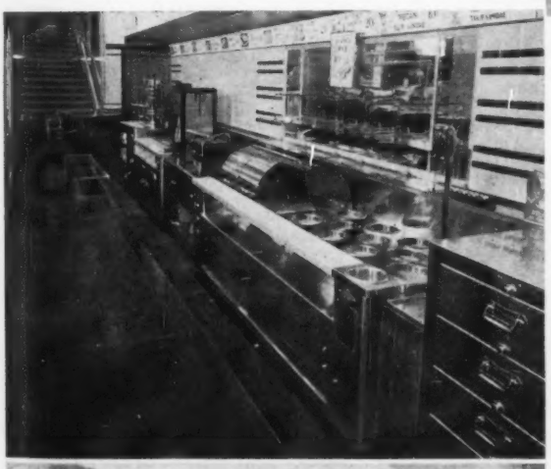
Seattle's newest operates all-electric

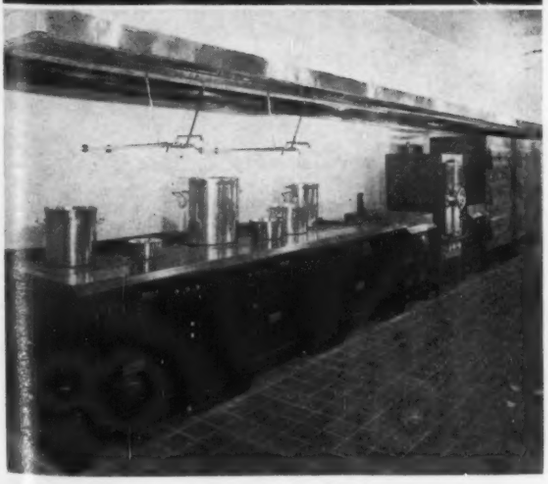
WOOLWORTH'S, in Seattle, has gone all-electric. Its newest and largest store on the Pacific Coast takes advantage of every service which Reddy Kilowatt can perform. With Puget Sound Power & Light Co. rates down to the five and dime level in its latest reduction, cooking, food service, air conditioning, lighting and signaling are electric in this store.

O. A. Carlson Electric Co., electrical contractor, with T. E. Collingwood in charge, made the installation. Lighting details are described on the next page. The electric cooking and food service are illustrated below.

Along one wall of the main floor, air-conditioned kitchen are banked three heavy duty ranges, two of 18.2 kw., one 16.7 kw. In step saving line are a cooks' 8-kw. deep fry kettle, a 6-kw. pressure cooker, a bakers' fry kettle, and two 12.6-kw. bakery ovens. Built-in, and handy along the other wall are the cold storage plant and refrigerators. Heavy tables, with electric food choppers, mixers, parers and slicing machines and a large mixer between tables, face the ranges.

To trap grease, removable filters are installed in the canopy over the cooking and baking line, feeding into the air-conditioning system. Ranges and ovens are shown at the bottom of the page. The hood, illuminated from inside, extends across the entire kitchen.





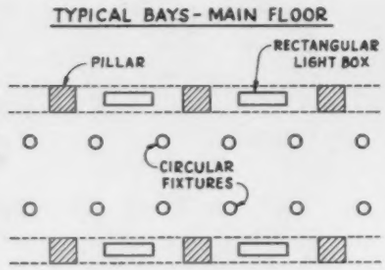
Electrically operated dumb waiters carry prepared foods down to two half-block-long fountain lunch counters on the floor below. Back of these counters, in step-saving sequence, are arranged coffee urns, cold tables, conveyor type toasters, sandwich grills, food warming tables, bun and roll warmer compartments, fudge warmers. Microphones, wired to kitchen loud speakers, convey orders to the cooks from the waitresses below.

Food warmers do double duty. Dishes are stored and warmed in the lower compartments. The top contains meat pans, wells for soups, gravies and vegetables, each compartment of which may be kept at the individual temperature best suited to that food, a distinctive advantage of the electric warming table.

Other equipment at the counters includes malted milk mixers, and dumb waiters to carry dishes back to the steam cleaning dishwashers.

Elimination of noise on the sales floors is aided by the employment of signal lights instead of lung power to call department heads and delivery clerks.

Puget Sound Co. cooking specialists stood by to help with the initial operation of the equipment. Connected load at this F. W. Woolworth Co. store totals 772 kw., of which 532 kw. is general light and power, 240 kw. for cooking and heating. Lighting load alone is 280 kw. Window lighting consists of 150 Curtis Xray 200-watt reflectors on 1-ft. centers. The first use in Seattle of Lustron removable letter signs of 50-watt capacity is made also.



View of main floor, at right, and at left, a schematic drawing of typical bay layout

LIGHT for a STORE

Incandescent

Who

F. W. Woolworth Co. new store, Seattle. Curtis Lighting, Inc., equipment and engineering; O. A. Carlson Electric Co., contractors; T. E. Collingwood, superintendent.

The Need

For intensive self-service merchandising of many small articles, a general intensity of 50 ft. candles at counter height. Sufficient lighting of the ceiling but most of the light down on the counters.

Conditions

Both main floor and downstairs 178 x 110 ft. Ceiling 15½ ft. Ceiling and walls light color. Woodwork light natural wood.

Installed

Main floor: 85 circular fixtures, special design with 1000-watt, bipost X-Ray silvered glass reflector behind ornamented louvered door and frame on partially recessed drum, lamped 750 watts. Spillring lights ceiling indirectly. Spacing 12½ x 11 ft. 9 in. Supplementing those are 45 rectangular units in which are two 300 watt lamps. Downstairs: 218 circular recessed fixtures, 500 watt lamps, Pyrex diffusing glass lens. 500 ft. of fluorescent, white, used over wall displays and back bar of lunch counter.

Results

At counter level, 30 to 70 ft. candles, main floor. Downstairs, 20 to 100 ft. candles.

LIGHT for a FACTORY

Incandescent

Who

New plant of Federated Metals Div., American Smelting & Refining Co., San Francisco. Court Kinnison, project engineer; Westinghouse Electric & Mfg. Co., lighting equipment; Kuchel & Sievers Electric Works, electrical contractors.

The Need

General illumination of satisfactory quality and in an amount sufficient for visual tasks in non-ferrous metal refining and machine shop, warehouse and laboratory.

Conditions

Bay roofs peaked, 19 ft. from bottom cord to peak, 44 ft. from ground to peak. Main building 160 ft. x 410 ft.; five bays 75 x 160 ft., one 35 x 160 ft. Ceilings corrugated iron. Structural members painted aluminum. Walls corrugated iron and glass sash.

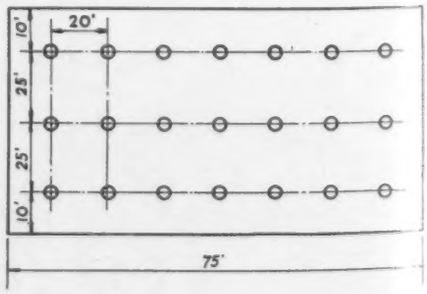
Installed

Fixture and wire capacity for 750 watts. Westinghouse Alzac high bay units, lamped at 500 watts, with dust covers, enamel coated exterior to withstand corrosive fumes, on 20 x 25-ft. centers. Switching arranged so daylight can be supplemented gradually as needed, with minimum use of light.

Results

Average initial night reading 3 ft. above floor level, was 15 ft. candles. In operation measures 13 ft. candles. Eventual average in service expected to be approximately 11.

Foundry floor, at left, and diagram at right of spacing of units in a typical bay



James M. Ketch, left, with the G-E Lighting Institute on wheels. With it G-E experts will tour the West in January and February and bring lighting schools to the far corners of the land

Barnstorm

And other Lighting News Spotlighted in sharp focus

THAT old one about Mohamet and the mountain is about to be done in lights by General Electric's traveling Lighting Institute which will bring Nela Park to the far West during the months of January and February. James M. Ketch, Walter Sturrock and Charles E. Weitz, engineers from the Nela Park staff will be its master showmen in a tour that includes shows, schools, talks, and exhibits, made to fit any kind of audience, in any size or kind of town.

Coming into the West from the South, the institute on wheels will stop in New Mexico and Arizona, then spend a week, beginning Jan. 27, in southern California.

Schedule includes IES day at Los Angeles Electric Club, that noon, with the subject, "Light Marches On." Tuesday night will be a meeting with the Electrical Maintenance Engineers at Edison auditorium, featuring "Lighting for Production." Tuesday and Wednesday, all day lighting schools for the industry will be held in the same place. The electrical industry of the Orange Empire will hear about "Fluorescent Lighting" at a special dinner meeting in Riverside, Jan. 30. On Friday, Jan. 31, Ketch and troupe will make three presentations in the new auditorium of San Bernardino Junior College, two daytime meetings to educational groups, the evening meeting for the public.

Next two weeks will be spent in northern California, with dates scheduled for San Jose, Feb. 3; San Francisco, Feb. 5, 6 and 7; Fresno, Feb. 10; Sacramento Feb. 12; and Chico for the first time will have such a show Feb. 14. The institute will then roll up to Portland, Seattle and other Northwest cities for a series of meetings to be announced next issue.

In San Francisco the institute will hold a street lighting school for both public officials and utility and equipment salesmen. Other meetings will be for architects and engineers and user groups. A commercial lighting conference of utility and lighting equipment people will be held on Wednesday, a lamp dealer meeting Friday evening, stressing promotional materials and merchandising.

With Ketch will come a troupe consisting of those shown in the photograph above, who are Ketch, Gordon A. Conkle, junior engineer, Mary Webber, home lighting specialist, L. C. Kent, Nela Park institute director, Aileen Page, home lighting, C. E. Weitz, Helen McKinlay, home lighting, A. L. Reas, and Walter Sturrock. Resident engineers of the lamp department, Alston Rodgers in Los Angeles, Sam Hazelton in San Francisco, and Walter Potter in Portland, will assist in their respective territories.

IES Region H

From Frank Hansen, vice president for the newly formed Region H of the Illuminating Engineering Society comes news of so much activity that this organization now commands a dominant position in industry affairs in the West. Here are a few spotlighted names, dates and places:

● SECOND PACIFIC REGIONAL CONFERENCE of IES is definitely scheduled for April 25-26, in PG and E auditorium, San Francisco. General convention chairman is W. P. "Teddy" Bear. Dr. Leland H. Brown, Stanford University, is papers committee chairman. Conference, on the pattern of the highly successful one in Los Angeles last April, will spend a day and a half in papers and discussions, have an evening dinner social.

IES President A. D. Cameron will make a special trip to attend and participate. A tour of lighting installations of exceptional interest will be made in the bay area.

● IES REPRESENTATIVES for the various western states have been appointed by Frank Hansen, regional vice president, as follows: Nevada—Fred Steiner, Jr., Sierra Pacific Power Co., Reno; Idaho—Orland C. Mayer, Idaho Power Co., Boise; Montana—Robert E. McDonough, Montana Power Co., Butte. Previously appointed to places on the regional executive board were: Foster K. Samson, chairman Southern California Section, Southern California Edison Co., Los Angeles; Kenneth K. Knopf, chairman San Francisco Bay Cities Section, Westinghouse E&M Co., San Francisco; C. T. Bakeman, chairman Washington State Chapter, Puget Sound Power & Light Co., Seattle; Walter F. Potter, northwest executive board member, Lamp Dept. G-E, Portland; and Thomas F. McDonough, Arizona representative, Central Arizona Light & Power Co., Phoenix.

● DENTAL OFFICE LIGHTING has been made the object of an engineering analysis by the dental lighting committee of the Southern California Section, IES. It represents the work of over a year, initiated when Dr. Carl Adams of San Bernardino, after a survey of dental offices, suggested this as a project to the Section. Committee personnel included Urban Beh, G-E Supply Corp.; F. C. Leach, Bureau of Power & Light; Alston Rodgers, G-E Lamp Dept.; Herbert J. Mayo, Smoot-Holman Co., and Roy Dahlin, Edison Co. Presented to 350 members of the Southern California Dental Assn. at an annual convention, the paper will be published by it.

● STUDENTS OF WESTERN UNIVERSITIES this year may enter the annual IES Beaux-Arts competition for the first time. The competition is that for the best engineering lighting-in-architecture design on a prescribed type of structure. Students, preferably upper classmen, are asked only to pay a registration fee of $2.50 to the Beaux-Arts In-

Washington State Chapter of the IES, newly formed in Seattle and headed by C. T. Bakeman, (center of the head table) of Puget Sound Power & Light Co.

stitute of Design, 304 East 44th St., New York City. Information as to the competition may be had there too.

● WASHINGTON STATE CHAPTER was selected as the official name of the newly formed IES chapter in Seattle. Officers elected were: C. T. Bakeman, chairman, PSP&L; Bert Heinz, G-E Supply Corp., secretary-treasurer; Board of managers—Dr. F. A. Osborn, University of Washington, George Boyd, Westinghouse E&M., William D. Williams, Seattle City Light Dept. Dr. Osborn was recently honored by the IES council executive committee when it raised his status to that of member emeritus, the highest in the ranks of the society. Frank Murphy, of Portland has also been nominated to that honor.

Other Highlights

● IDAHO LIGHTING MEN loaded up on all the latest developments in fluorescent and incandescent at meetings held in November at the Boise, Pocatello and Twin Falls offices of Idaho Power Co. Orland C. Mayer, commercial and industrial lighting manager called in D. A. Pearson and Walter Potter, of G-E, and Frank Young of Westinghouse, and J. Carl Baldridge, Idaho Power dealer representative, to discuss the applications and problems connected with these light sources. After a dinner the meeting was turned into an "Information Please" quiz on lighting.

● PACIFIC GAS AND ELECTRIC CO., from November to May, is conducting a seven months course in commercial lighting. Attended by commercial lighting men and industrial power salesmen in the area, the same course is being held both in San Francisco and Oakland.

The series of group meetings are being held twice each week, and each session lasts two hours. Lectures by men prominent in their fields are supplemented by informal open discussion by those attending the sessions.

Lecturers for the course include lamp and equipment manufacturers' representatives, members of the faculty of the Univ. of California at Berkeley, representatives of manufacturers in fields allied with the lighting industry. The course will also include a visit to the Illumination Engineering Laboratory of the university.

The sessions will be carried on by John Walsh of the industrial lighting department of the PG and E general sales staff, who will act as discussion leader.

MOSS

● FRANK K. MOSS, physicist associate of Dr. Matthew Luckiesh in numerous researches and books on lighting and seeing, came West from G-E's Nela Park, Cleveland, to address two meetings of professional people and to lay before them the scientific background of the research in the Science of Seeing. At International House, University of California, Berkeley, Moss shared the program with Dr. H. E. Bennett, posture and seating specialist, on the Sight Conservation Council of Northern California program. In Los Angeles he was presented by the Western Institute of Light and Vision, at Edison auditorium and was heard by 406 educators, vision specialists and lighting engineers.

● 100 FT. CANDLES of light is the minimum which Pacific Division, Lamp Dept., G-E, will have now that it has moved its offices from the Russ Building, San Francisco, to the lamp factory at 1614 Campbell St., Oakland. The move was made Dec. 23, and announced by M. C. Hixson, manager of the division. The new offices, he says, reflect the most up-to-date ideas in office arrangement and lighting.

● TO REDUCE ACCIDENTS on Salt Lake City's "Highway of Death" U. S. Highway 91, the Utah Power & Light Co. is installing 100 sodium vapor lamps staggered at 160 ft. intervals on 2nd West St. between 8th North and 9th South Sts. together with 58 white incandescent lights at intervals of 125 ft. staggered between Harvard Ave. and 21st South St. on State St.

Sixteen persons have been killed in traffic accidents in the area to be lighted within the past four years, 12 of them pedestrians and one a bicycle rider. Cause of these deaths has been traced directly to poor visibility.

Reason for the selection of white lights for South State St. is the contrast that will be given from the yellow sodium vapor lights now maintained by Salt Lake County which end at 21st South St., the city limits. It is believed the sudden change from yellow to white illumination will give notice to motorists that they are entering the city and should reduce their speed.

● FRIENDLY WARNING has been sent to all customers of Pacific Gas and Electric Co. that after Jan. 1 it will begin enforcing rigidly its power-factor correction rule approved by the Railroad Commission. The rule applies to everything from single lamp desk units, on up. "There can be no discrimination between these customers," the letter states, "who now enjoy one of the lowest electric rates in the United States, and those who may install equipment on the lines which might retard further rate reductions."

Outlets by the Yard

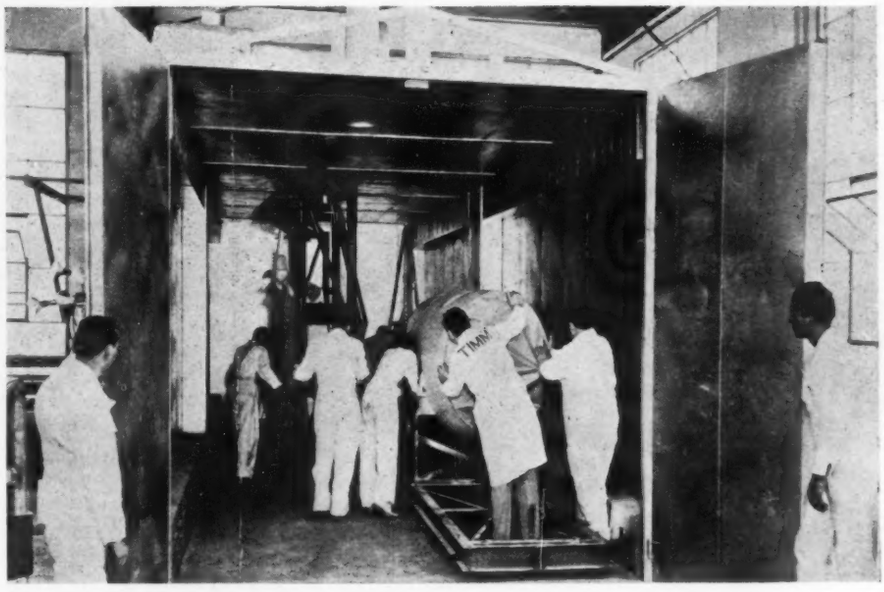
Promotional plan has popular appeal

Catchy enough to appeal to a wiring-shy public, and with an appeal too to both contractors and utilities for a joint promotional idea, is a plan to sell outlets by the yard being initiated by National Electric Products Corp.

Basis of the plan is the offer of packaged combinations of this company's "plug-in" strip, together with cable to run to a circuit, at standard prices, (see below). This offer by contractors and utility along a program suggested by the manufacturer, would lift outlets out of the unknown into popular visible merchandise, easy to buy, install and understand, it is maintained.

That ripping out walls or floor is unnecessary, that installation is easy and looks nice, that package units can be found to fit any condition, and that complete convenience is easy to obtain, are the appeals to the public. To contractors the package idea offers a selling vehicle long needed; to utilities an idea to open up the bottle-neck to appliance markets.

The idea is implemented with a complete program of advertising and promotion materials and will be nationally advertised.



Plastic Plane

Electric oven used to fuse resins into hard bond

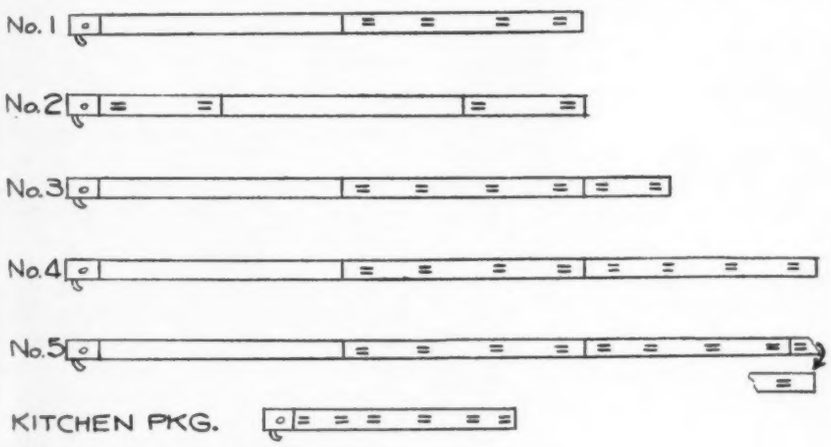
With plastic planes becoming prominent in the new defense program and also increasing in popularity for private use, electric ovens are playing another important role in the aircraft industry. While a number of firms are experimenting with plastic planes, the Aeromold process developed by the Timm Aircraft Co., at Van Nuys, Calif., is of special interest because oven shown here is an important part of that process.

The assembled structure is placed in an oven for curing within 1 hour after its completion. Here it is baked at temperatures from 180 degrees F. to 250 degrees F. for from 2 to 4 hours under closely controlled humidity conditions. The phenol-formaldehyde resin under heat and a slight pressure reacts to become a hard, fast bond. The baking process fuses all the elements into a smooth, light, efficient plastic-plywood structure. The resulting plane because of its extreme smoothness, low cost of fabrication and good mechanical stability for a given weight fills an important role in the high speed production program required these days.

The oven, manufactured by the Despatch Oven Co., was installed at the Timm Aircraft plant and has inside working dimensions of 10 ft. wide, 10 ft. high, and 40 ft. long.

The heat for the oven is supplied by a 100 kw. Despatch open coil electric heating system mounted on top of the oven in an insulated chamber. The air is circulated from this chamber by a high capacity fan which forces the heated air down into heat ducts that are mounted near the floor along each sidewall. These ducts have ports with adjustable dampers so that remarkable uniformity of temperature may be obtained in the oven.

The air travel is vertical with recirculating ducts mounted near the roof of the oven along the sidewall. These recirculating ducts are interconnected with the fan which is a part of the heating system. The air circulation is rapid and uniform assuring proper processing of the plastic resin.



PACKAGE COMBINATIONS
(Outlet Spacing—18 in. Apart)

Measure wall space—determine outlets needed and select appropriate package. Simple installations—merely clips to baseboard. One electrical connection to an existing feeder. Strip may be painted any color. At least 80% of all light-conditioning jobs with floor or table lamps may be accomplished with one or two of these packages!

No. 1— 4 outlets along 6 ft. 6 in. up to 12 ft. 6 in. of wall. Suggested price....$ 7.50
No. 2— 4 outlets along 6 ft. 6 in. up to 12 ft. 6 in. of wall. Suggested price....$ 8.75
No. 3— 6 outlets along 9 ft. 6 in. up to 15 ft. 6 in. of wall. Suggested price....$10.00
No. 4— 8 outlets along 12 ft. 6 in. up to 18 ft. 6 in. of wall. Suggested price....$11.00
No. 5—10 outlets along 15 ft. 6 in. up to 21 ft. 6 in. of wall. Suggested price....$13.75
Kitchen package complete with fittings and 30 ft. of ABC cable. Suggested price..$ 6.40

EMEA "Dope" Sheet

[No. 1 of a series of boiled-down, practical work sheets worth keeping handy to use]

Edited by Howard C. Park
EMEA of So. Calif.

What the Electrical Maintenance Man Ought to Know About

Wire and Cable Terms

WIRE—A wire may be a metallic thread, slender rod or bar (or other cross-sectional shape), or filament, of uniform diametric (cross sectional) dimensions.

However, in ordinary electrical parlance a single conductor, even though it may be stranded or a combination of strands, is commonly referred to as a "wire."

WIRE GAUGE—The American Standard for wire sizes is (A.W.G.) American Wire Gauge, commonly known as B. and S. or Brown and Sharpe.

WIRE SIZES—Wire sizes are determined by the cross-sectional area of the wire. Wire sizes larger than 4/0 are designated by their cross-sectional area in *circular mils*.

Wire sizes of No. 0000 (4/0) and smaller are designated by numbers, the diameter or cross-sectional area of which can be determined only by the use of wire tables or calculated by given formulas. The larger the wire size number, the smaller the wire.

CIRCULAR MIL—A *circular mil* is a unit of area. It is the area of a circle one mil (.000") in diameter.

The circ. mil. area of a round wire = diameter (in mils) squared.

The circ. mil area of any shaped wire other than round may be determined by multiplying the square mil area by 1.2732.

One mill = .001 inch
One inch = 1000 mils.

One cir. mil = .7854 sq. mil or .000000785 sq. in.
One sq. mil = 1.2732 cir. mil.

A circle 1 in. dia. = 1,000,000 cir. mil or 785,400 sq. mil.
A circle of 1 sq. in. = 1,273,200 cir. mil or 1,000,000 sq. mil.

CONDUCTOR—The term "conductor" as used in conjunction with wire and cable; may be a single wire or combination of wires not insulated from one another, suitable for carrying an electric current. However, the group, as a whole, may be bare or insulated.

STRAND—A strand is a single wire of a group of wires, or a group of wires of a combination of groups or stands, of a stranded conductor.

CABLE CONDUCTOR—A cable is a combination of strands of wire, or group of strands of wire, arranged to form a conductor. In a *single conductor cable* the strands or group of strands are not insulated from one another. In a *multiple conductor cable* the strands or group of strands are insulated from one another in such a manner as to form more than one conductor. A cable conductor may be described by the manner in which the wires are arranged along its axis (length), or according to their type of arrangement in respect to its cross-section.

LAY—The lay or pitch of any helical element of a cable is the axial length of a turn of the helix of that element.

DIRECTION OF LAY—The direction of lay is the lateral direction in which the strands of a cable run over the top of the cable as they recede from an observer looking along the axis of the cable.

Common Types of Cable Stranding

ANNULAR STRANDING—The strands of an annular conductor are concentrically arranged around a suitable core. Core is usually composed of non-conducting material or is hollow.

BUNCH STRANDING—The term "bunching" or "bunch stranding" is applied to a collection of strands twisted together in the same direction without regard to the geometric arrangement of the strands.

COMPACK STRANDING—Consists of a series of layers of strands all of which are laid in the same direction and rolled to a predetermined shape.

CONCENTRIC STRANDING—A concentric stranded conductor consists of a central wire or core surrounded by one or more layers of helically laid wires applied (except in compack stranding) in a direction opposite to that of the layer under it. Each layer after the first (which has 6) has 6 more wires than the preceding layer.

ROPE STRANDING—A rope stranded conductor is a concentric stranded conductor, each of whose component strands is itself stranded. A rope stranded conductor is described by giving the number of groups laid together to form the rope and the number of wires in each group.

SECTOR CONDUCTOR—A sector conductor is a stranded conductor whose cross-section is substantially the shape of a sector, an ellipse or a figure intermediate between them.

SEGMENTAL CONDUCTOR—A stranded conductor composed of a number of sectors, usually insulated from one another.

SHIELDED CONDUCTOR—One in which the insulated conductor or conductors is/are encased in a conducting covering.

SPLIT CONDUCTOR CABLE—Is a cable in which each conductor is composed of two or more insulated conductors connected in parallel.

FLEXIBILITY—A cable may be referred to in relation to its flexibility as rigid, semi-rigid, semi-flexible, flexible, extra-flexible or super-flexible. The greater the flexibility, the larger the number of strands and the smaller the strand size required for a given size and type of cable. Such conductors have a higher resistance than standard strand conductors of the same cross-sectional area.

INSULATION RESISTANCE—The insulation resistance of an insulated conductor is the resistance offered by its insulation, to an impressed direct voltage.

FACTOR OF ASSURANCE of wire or cable insulation is the ratio of the voltage at which it is tested to that at which it is used.

(Next time—Wire calculation short-cuts and formulas)

Table Top

The second annual Table Top Exposition was held by the Electrical Maintenance Engineers' Assn. of Southern California, Dec. 7 at Scully's, Los Angeles. Employing the same idea as that found so successful last year, manufacturer affiliates of the association exhibited such devices, fittings, materials, or catalogues as can be contained on a 36-in. card table. The exposition opened at 2:30 in the afternoon and continued into the evening.

A buffet dinner was served to members of the association and an opportunity given to visit each of the exhibits, to talk with those in charge, obtain information and ask questions regarding the products of the manufacturers represented. Attendance was 350.

Wealth in Water

Increased per-acre yield pays energy plus investment costs in year

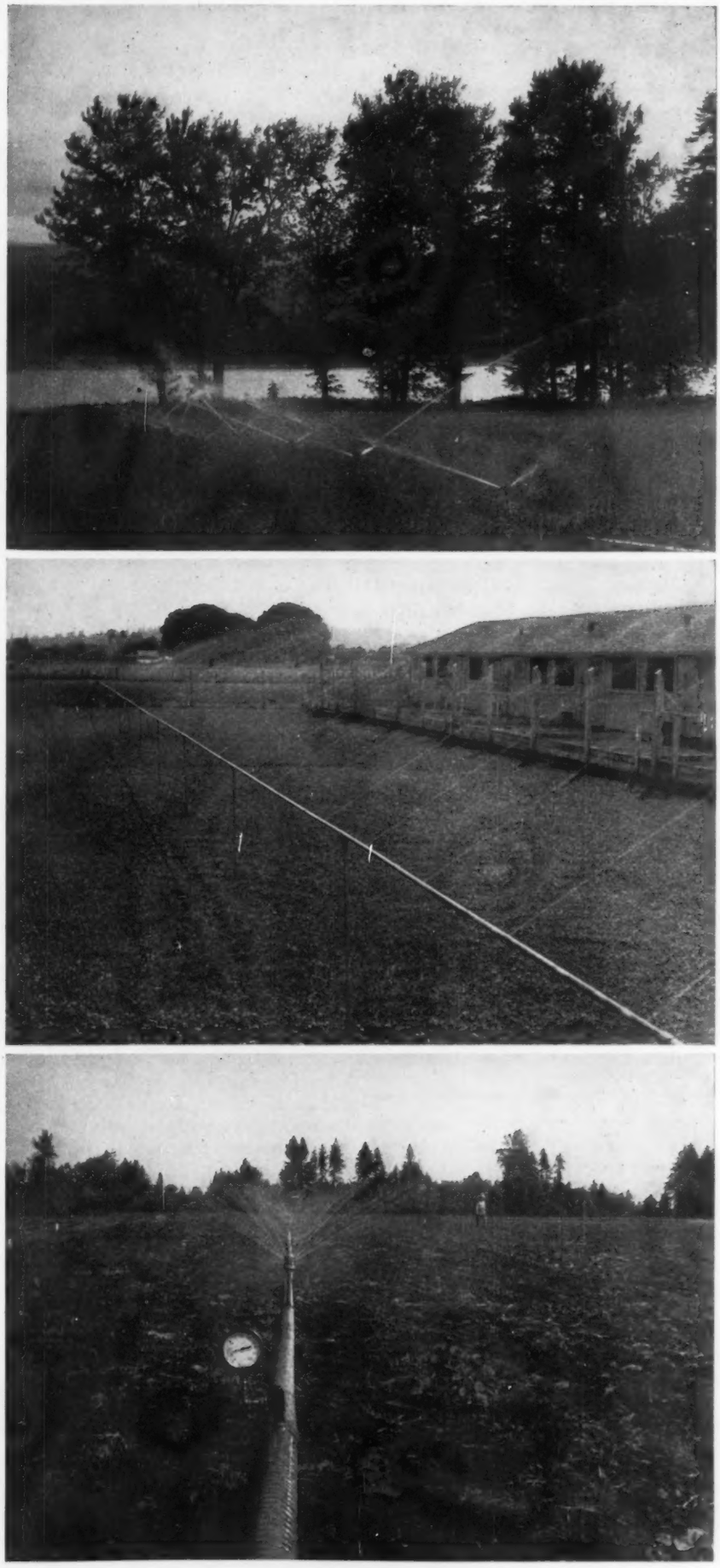
Benefits of irrigation to Oregon farms have been demonstrated to farmers of that State by means of periodic inspection tours conducted by Oregon State College. More than a hundred farmers participated in the eleventh such tour recently. The tours, usually held on the college experimental farms, have proved an effective way of promoting rural electric load by stressing the importance of electric pumping.

Program material is presented by members of the college staff. Participating in the last tour were Earl Price, head of the agricultural engineering department; Everett Davis, extension division agricultural engineer; and R. E. Fore, associate agronomist.

To give an idea of the possibilities of irrigation it was pointed out that watering of the college hop farms in 1939 increased net income $85 per acre. A 7½-h.p. electric motor installation was used to irrigate 30 acres, 15 acres of hops and 15 of vegetables and field crops. The investment per acre in irrigation equipment averaged $50. The total annual and fixed charges averaged $12.25 an acre to irrigate hops. Water was applied at a rate of 2½ to 3 inches in 8 hours of sprinkling time.

Various types of irrigation equipment are demonstrated on the tours with emphasis placed on correct applications. Three-phase motors are recommended with a 1,725 r.p.m. V-belted type declared to be the most practicable because it may be used for other farm tasks. Low-pressure sprinkling systems operated at 10- to 15-lb. pressure and applying one-half to one inch of water per hour or high-pressure systems operated at 30- to 40-lb. and delivering one-third to three-quarter inch of water per hour are advised for most Oregon conditions.

Arguments in favor of irrigation are clinched by citing higher yields such as 2,200 to 3,000 lb. of sugar-beet seed or 15 bushels of red clover seed per acre.



Types of sprinkler irrigation systems demonstrated to Oregon farmers. High pressure system on pasture (top), stationary system on Ladino clover for poultry (center) and low pressure system of 10 to 15 lb. for field crops (bottom).

PCEA Panorama

ELECTRIQUIZ

Test yourself on this true or false quiz. Answers on page 70.

1. Magnesium oxide is a common material with the uncommon property of being suitable for use either as a heat insulator or a heat conductor.
2. On any lighting circuit the voltage is constant, the amperage varying with the number of lamps in the circuit.
3. The total membership of the Pacific Coast Electrical Assn. is approximately 3,000.
4. Dr. Matthew Luckiesh is a prominent physician.
5. The Nevada - Calif. Electric Corp serves great extremes in elevation.
6. Metal "post holes" are carried in stock by the Nevada-Calif. Electric Corp. for digging post holes in Imperial Valley sandy country.
7. Porous sleet as large as 17 in. in diameter has been measured on broken conductors in the San Bernardino mountains.
8. NEMA is a new federal bureau established to regulate the electrical industry further.
9. Abraham Lincoln said, "Be courageous. Be as brave as your fathers. Have faith. Go forward."

The contributors to this month's *Electriquiz* are A. Frank Ayres, Nevada-Calif. Electric Corp., of Riverside; W. B. Cheney and G. M. Rankin of the Southern California Edison Co., Los Angeles.

Win a Trip!

Feb. 1 is deadline for the PCEA essay contest. "Why You Should Rent, Buy or Build ONLY an Adequately Wired Home" is the subject for the papers, which should not exceed 750 words.

Prizes will consist of trips to the 1941 PCEA convention at Hotel Del Coronado, Coronado, Calif., May 21 to 23, with all expenses paid. Contest entries may be mailed to PCEA at 447 Sutter St., San Francisco, or 601 West 5th St., Los Angeles.

The competition is open to all employees of Class A members, except officers and department heads. Class A members are companies which belong to the Association. The contestant's name must not appear on his entry. His name, company affiliation and address must be written on a separate piece of paper and enclosed in a sealed envelope attached to the entry.

Essays will be judged on composition, logic, originality and value of ideas. The judges will be George C. Tenney, editor, ELECTRICAL WEST, chairman; A. C. Joy, advertising manager, PG and E, and Agnes Barrell, advertising counselor, Northern California Electrical Bureau.

A fund of $300 has been appropriated by the board of directors to send a minimum of five winners to the convention. Twelve leading entries will be selected by the judges, and as many of their writers will be sent to the convention as can be provided for.

The contest is being sponsored to emphasize the importance of adequate wiring in home comfort, and to direct each member's attention to the part he can play in furthering acceptance of better wiring standards.

For Better Wiring

Practical wiring help for architects and home builders is being made available by PCEA through its standardized services committee, which has prepared several recommended service installations based upon floor area. By using these standards, the provision of adequate service-entrance facilities, providing extensive electrical conveniences and even the 100 percent electrification of the home is a matter of measuring its floor area.

Present plans for promoting this new development include its incorporation in southern California with Red Seal wiring literature and activities of Red Seal representatives. It will not be a requirement for certification, however. In northern California the new plan will be tried out for a test period as the opportunity arises.

Hard-Working Group

Efforts of the PCEA's new publicity committee, created late last summer by C. E. Houston, Association president, resulted in the publication of 1,741 column inches of newspaper publicity from Sept. 1, 1940 to Jan. 1. This is the equivalent of about eleven standard-size newspaper pages, and represents favorable publicity for the electrical industry in all parts of PCEA membership territory.

District meetings last fall, the director's meeting at the Los Angeles County Fair in September, and the fall conclaves in Oakland and Pasadena were publicized liberally. Heading the committee is Howard W. Hayes, assistant advertising manager, So. Calif. Edison. Members include F. M. Raymond, director of advertising, San Diego, G & E: J. R. Gabbert, advertising agent, Nev.-Cal. Electric; J. A. Corlett, G-E, Los Angeles; C. L. Palmer, P G & E, Fresno; Earl M. Seel, P G & E, San Francisco; C. L. Huyck, Graybar, San Francisco; and H. S. Schuler, Westinghouse, San Francisco.

WHO AM I?

I was one of the early residents of Yosemite Valley, since I was born in what is now Yosemite National Park on May 9, 1879. My father was a farmer in the valley, and I attended school there amid some of the greatest scenic wonders of the world. Later I attended Oakdale High School and Heald's Business College. Who am I?

My first job was with the Holt Mfg. Co. in San Francisco, where I worked as stenographer and bookkeeper before I joined the electrical industry in 1898 as stenographer and bookkeeper with the John M. Klein Electrical Works. Later I was promoted to salesman. Who am I?

I found sales work definitely to my liking, and in the course of the next few years I was accorded several promotions. When the Pacific States Electric Co. succeeded to the business of the John M. Klein Electrical Works and others, I continued with the organization. Who am I?

My home is in San Francisco. I am married and have two children. I am a member of the Free and Accepted Order of Masons, the Rotary Club, Commercial Club, Transportation Club, Chamber of Commerce, and the Merced Golf and Country Club. My present position is vice-president of the General Electric Supply Co., San Francisco, and my name is: See page 70.

Research "Magic"

With a number of new scientific experiments in his kit and new versions of older ones, Westinghouse's Dr. Phillips Thomas returns West for public and industry showings in January. A one-man laboratory show, Dr. Thomas carries with him a truckload of equipment, puts on his show with skill and humor, and this year interprets many of the applications of science to defense materials making.

Beginning Jan. 6 at Los Angeles Electric Club, Dr. Thomas goes next to the San Diego Electric Club, Jan. 7, then back to Los Angeles to show before the National Assn. of Power Engineers, Jan. 9. At Fresno, Jan. 13 a public meeting sponsored by the Engineers Club will be held. He may then go to Santa Cruz, Jan. 14, and San Francisco Jan. 15.

Jan. 17 he goes to Reno, then to Medford, Ore. Jan. 20, to Eugene Jan. 21, Corvallis, Jan. 22, and Portland, Jan. 23. He will be in Seattle Jan. 27 and Spokane Jan. 29. From there he is tentatively scheduled for dates in Salt Lake City and Great Falls, Mont.

Contractors

To determine uniform policy as to a number of pieces of state legislation affecting contractors and also national policy respecting the federal defense construction program, the wage and hour law, federal indictments of associations, and to elect officers for the new year, the Electrical Contractors Assn. of Northern California will hold its annual meeting at Oakland, Jan. 25.

It will be a one-day, all-day meeting, with a luncheon get-together at noon at which the Alameda and Contra Costa Counties Assn. of Electrical Contractors will be host. Grover Grider, Grider Electric Co., Stockton, president, will preside.

Clyde L. Chamblin, division 9 representative on the labor committee of National Electrical Contractors Assn., and Ted Curry, president of the Fresno association, will give reports on the recent NECA convention at Jacksonville, Fla.

Important state topics to be reviewed include the qualification tests to be required under the state contractors license act, the use of the trustee clause to protect sub-contractors on contract, the effort to obtain more enforcement of the California State Safety Orders, the delay in revision of these Safety Orders to match the 1940 NE Code, the revision of Railroad Commission rules affecting service drops to small and low residences.

National matters to be discussed include efforts to obtain some recognition of the subcontractors in the national defense construction program, the effect of the wage and hour law on local contracting, the federal indictments of contractor associations, the NECA labor policy.

Interchange of ideas on local association policy will probably be held on such subjects as labor shortage, apprenticeship, wage trends, operation under the California Unfair Trade Practices Act, and other similar topics.

Dealers

H. C. Darroch, Canadian General Electric Co., and chairman of the Home Appliance Council of the Electrical Service League of B.C. has been reappointed to that office. E. Cooper, McLennan McFeely & Prior Ltd., was appointed vice-chairman. Other members of the Council are G. N. Gardiner, Canadian Westinghouse Co., B. Markham, Northern Electric Co., and H. Merilees, B.C. Electric Railway Co.

The Home Appliance Council has developed a program for the year 1941 and submitted it for approval by the Council of the League. Under this tentative program the lighting division under the chairmanship of R. Hall, manager of the Electrical Service League, will launch its special lighting drive on Jan. 18. The annual merchandising conclave, with Harold Merilees in charge of arrangements, is planned for Feb. 20-21. E. Henderson, Western Agencies, will head up plans for the refrigeration campaign to open in April.

Ranges will be featured in a special campaign planned for May and headed by C. Moffat of Moffat's Ltd. E. Cooper will be in charge of the laundry equipment promotion to be held in both the spring and fall at dates to be arranged. Radio will be promoted in November under direction of R.C.A. Victor and G. Norman Gardiner, Canadian Westinghouse Co., will head the merchandising of small appliances in a pre-Christmas drive next December. J. Lightbody, publicity manager, BCER Co., will head up the advertising for all committees.

● A NATIONAL SHOW and convention of air conditioning is definitely scheduled to be staged in San Francisco, June 17-19, 1941, under the joint sponsorship of the American Society of Heating and Ventilating Engineers and Air Conditioning Societies. Plans contemplate a big manufacturers' show at the civic auditorium, with one of the foremost trade exposition managers in the nation in charge and with all of the publicity and flare that such an exposition will generate turned loose to focus public attention to the importance of air conditioning in industry, commerce, defense work, as well as in the home.

● CELEBRATING their victory in selling 807 heating units in a two-months' campaign, fifty members of the Spokane, Wash. automatic heating division of the Inland Empire Electrical Equipment Assn., held a banquet in that city on December 11. Leon Boyle presided. H. C. Bender is secretary.

Inspectors

Chief benefit that inspectors and contractors derive from the meetings of the chapters of International Assn. of Electrical Inspectors is that of asking each other or qualified experts questions to clarify their own interpretations of code rules and wiring methods. That benefit came to members of several western chapters in meetings during the past month.

● SOUTHERN CALIFORNIA CHAPTER, in its last meeting, Nov. 27, held both at Edison auditorium and at the Elks Club, Los Angeles, had variety of topics to discuss. H. C. Rice, merchandise manager, Southern California Edison Co., opened the meeting with a paper describing the interest of utilities in the inspector and the Code and of both inspector and utility in the welfare of the public.

In discussion of ordinance revision several inspectors expressed doubt that they would incorporate the new wire tables in the 1940 Code. J. G. Moyen, Square D Co., presented a suggested table for time-delay circuit breaker protection for motor branch circuits which was sent on to the Southwestern Section article committee for the Code and to the Industrial Accident Commission. Ray Larrabee, Underwriters Laboratories field engineer, described a new field testing laboratory he now uses.

Fluorescent fixtures and power factor correction were also discussed as well as portable motor connections for wind machines in orchards and in factories.

In the election of officers E. Malmgreen, electrical inspector, Alhambra, was elected chairman to succeed W. O. Packard, Santa Ana city inspector. Herbert G. Ufer was reelected secretary-treasurer. Next meeting is to be Jan. 22, at San Bernardino, with the principal topic to be the wiring and protec-

tion of motor circuits, discussed by Frank Short, Industrial Accident Commission. The March meeting is to be held in Alhambra.

● CENTRAL CALIFORNIA CHAPTER, meeting in Fresno, Nov. 29, was devoted chiefly to discussion of the "Use of the Thin Wall Wire," in which John Mangan, district representative, wiring materials, G-E Co., of San Francisco, spoke. He assumed that the group knew the characteristics of the wire and devoted himself to the economics of its use and its present limited uses. The afternoon session listened to Richard Lake of San Joaquin Power Div., PG and E, on radio interference, the ratio between noises and signal strength and its causes. Frequency modulated radio, he said, would spell the end of much of the utility grief with this problem. D. A. Demanty, vice chairman, presided in the absence of C. T. Coyle, Fresno inspector, who has been seriously ill.

● NORTHERN CALIFORNIA CHAPTER, on request of many members at the November meeting, called a special round table meeting Dec. 18, at San Francisco city hall, to go over more of the 1940 Code changes. Contractors were especially invited. The first part of the session was devoted to clearing up interpretations regarding Code changes, especially respecting "six subdivisions of load." Harold Gerber, secretary, most familiar with the Code, conducted this part of the program. Harry Snedaker, city electrician of San Jose, chairman, presided.

The effect of the defense emergency in delaying the revision of the state Safety Orders was explained by George E. Kimball, electrical engineer, Industrial Accident Commission. Revision of order 64a of the Railroad Commission was also mentioned.

An interesting reaction to the ambient temperature provisions of the 1940 Code was the news that inspectors in two out of three cities were setting a "standard ambient temperature" for their communities by which all but special cases would be calculated. Exceptional heating in special locations would take the Code table correction factors. All ordinary jobs were to be figured at an arbitrary ambient temperature of 78 deg. F.

How the switchboard manufacturer could standardize circuit breakers in panelboards and meet all the vague possibilities under the wire tables of the new Code were wondered at by the inspectors. It was predicted that before long the industry would gravitate to a few if not a single type of temperature resisting wire for everything to avoid confusion.

● UTAH CHAPTER, IAEI officers, are conducting classes every other Tuesday to acquaint electrical contractors and their workmen with the new 1940 NE Code—how its revisions will affect working procedure and electrical installation. Electrical men numbering 65 to 110 from all of northern and central Utah are attending, which will result, chairman L. John Christensen believes, in a better understanding and fewer mistakes in the Code's application.

● OAKLAND'S NEW CITY ELECTRICAL ORDINANCE was presented to 250 electrical contractors, wiremen and inspectors by Ben C. Hill, superintendent of the electrical division, early in December. The new ordinance, going into effect Jan. 1, is based on the 1940 edition of the National Electrical Code. Hill explained changes from previous regulations, section by section, and the local requirements clarifying specific interpretations.

Agenda

Electrical League of Utah—Election and annual meeting held Jan. 8. To be featured are reports by committee chairmen and financial reports by secretary-treasurer Edward J. Duggan. First Board of Trustees meeting of the new year will be held Jan. 15. Regular monthly meeting to be held Feb. 26.

Utah Chapter, IAEI—Meetings first and third Tuesdays being devoted to careful study and analysis of the 1940 N. E. Code. Teachers and instructors are: J. Hyde Stayner, Superintendent of Meter Department for the Utah Power & Light Company; L. John Christensen, instructor at West High School, Salt Lake City; and L. B. Johnson, engineer of General Electric's Salt Lake office. R. G. Murray, electrical inspector, Provo, Utah, discussed circuits of 1940 Code at Dec. 17 meeting and election of officers for 1941 held at that time.

California Retail Hardware Assn.—Annual convention and hardware show, Western Merchandise Mart, San Francisco, Feb. 18-20. Max E. Ish, Salinas, president. Hardware show on fourth floor of the Mart. LeRoy Smith, managing director, in charge.

Among Electric Clubs—

San Diego—Combines Dr. Lowell Thomas, Westinghouse research lecture and the annual election of officers, Jan. 7, at Roosevelt Jr. High School. Nominated for president is Ray A. Edwards, safety engineer, San Diego Gas & Electric Co.; first vice president, Albert F. Stoll, Stoll Theatre Supply Co.; second vice president, Bruce B. Gavitt, G-E Co.; secretary treasurer, Dan Turner, SDG&E; directors, Charles F. Creelman, SDG&E; E. E. Shaffer, city of San Diego; Les Kobler, SDG&E; and Verne Engle, So. Calif. Telephone Co. Annual inaugural party, Jan. 21.

Los Angeles—Mary Pickford, Mayor Fletcher Bowron, J. L. Van Norman, president of the chamber of commerce, and Dr. Edwin A. Lee, dean of education, UCLA, were notables at the joint annual High-Noon luncheon with the Women's Auxiliary of the L. A. Chamber of Commerce to inaugurate the outdoor Christmas season. Harry L. Harper, past president of both Electric Club and chamber of commerce, was originator of the movement.

Seattle—"Hydro", a sound film portraying the construction of Bonneville and its transmission lines, was shown at the Dec. 9 meeting by J. W. Ferguson, of City Light. Charles F. Terrell, new operating manager, Puget Sound Power & Light Co., told of experiences in utilities in Texas and Florida, Dec. 12 meeting. Annual Christmas party, Dec. 20.

Vancouver—Recent meetings have heard G. M. Shrum, Dept. of Extensions, University of B. C., on "Splitting the Atom—an Accomplished Fact," E. W. Johnson, branch manager, Canada Wire & Cable Co., on "Evidence of Misspent Lives," and Eric Ackland, manager, Lamp Sales Dept., Canadian G-E, and trade commissioner for New Zealand, on "Impressions gained and changes noted during a recent trip to New Zealand." Annual Christmas luncheon, Dec. 20, Ed Walker, B. C. Electric Railway Co., master of ceremonies, George Knowles, Canadian Telephone & Supplies, president, chairman.

Oakland—Westinghouse film, "The Middleton Family at the World's Fair," Dec. 9. "What War's Blackout Does to Lighting," by W. A. Cyr, ELECTRICAL WEST, Dec. 16. Annual Christmas party, Dec. 23.

San Francisco—"Panel Heating as Employed in England," by Prof. Hutchinson, University of California (see page 29) at the Dec. 16 meeting. Annual Christmas Kiddies Day program, with Art Rowe, chairman, arrangements in charge of the junior members, Dec. 23.

Air Conditioning Society, San Francisco—Joint meeting with Golden Gate Chapter, American Society of Heating & Ventilating Engineers, L. G. Gray, U. S. Weather Bureau, "Interpretation of Weather Bureau Records and Data as Applied to Air Conditioning," Dec. 3. J. A. Hill, PG and E, reported on weather data collected by that utility.

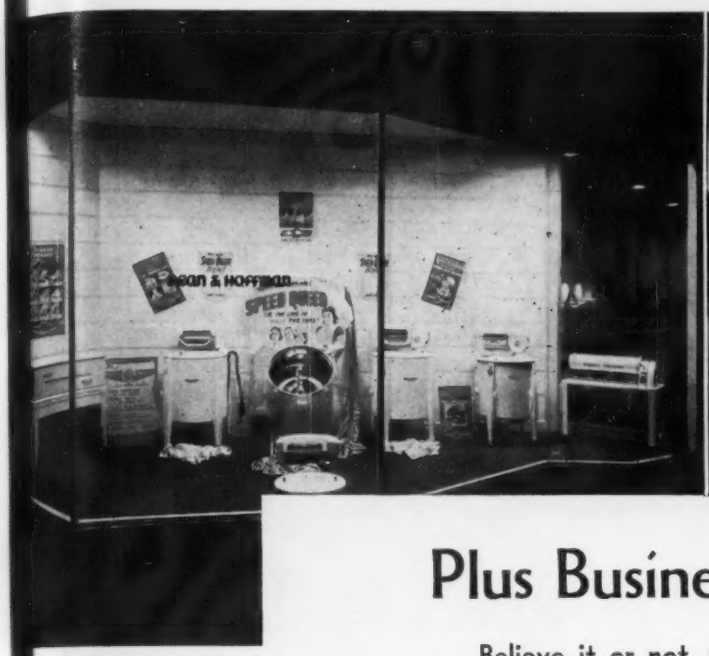
Electrical Contractors Assn. of No. Calif.—Annual meeting, Oakland, Jan. 25. Program to deal with state legislation, wage and hour law, Federal defense construction, Safety Orders revision and other subjects. Grover Grider, Stockton, is president.

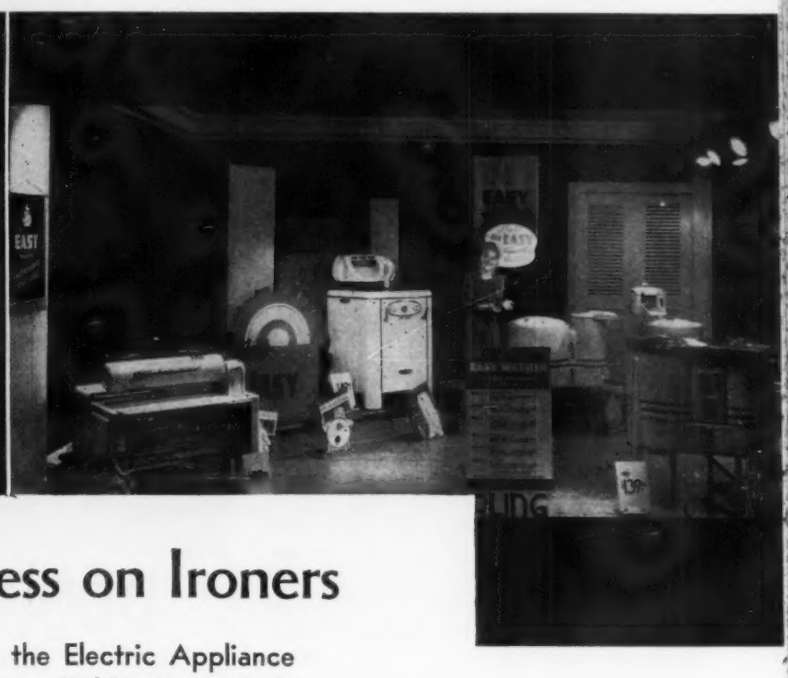
San Francisco Electrical Contractors Assn.—"The Wages & Hours Act," by Irving Schoenfeld, attorney for the NLRB, and Ross L. Perkins, "The Unfair Trade Practices Act," at the Nov. 28 meeting. Revision of the present wage agreement with Local No. 6, IBEW, was discussed Dec. 19. An increase from $11 to $12 a day was asked by the union. Negotiations are to continue.

IES—Los Angeles Section—Television meeting, Dec. 3, had as speakers, C. F. Wolcott, Gilfillan Bros. Inc., "What is Television," T. H. Shepherd, Bureau of Power & Light, "Lighting in Television Studios," and Miss Shirley Thomas, known as the queen of television, "Technique of Television Acting." The study club subject was "Design of fluorescent luminaires," led by Alston Rodgers, Lamp Dept., G-E.

IES—San Francisco Bay Cities Section—"Automotive Headlights and Traffic Safety," was discussed at the Dec. 19 meeting, by F. A. Ryder, illumination engineer, Dept. of Motor Vehicles, Sacramento. January meeting will be an inspection trip to the G-E Lamp Dept. factory and new offices, Oakland, to see the 100 ft. candle installation.

IES—Washington State Chapter—Charter metting with Frank Hansen, regional vice president, Seattle, Jan. 6. Portland meeting Jan. 7.





Plus Business on Ironers

Believe it or not, the Electric Appliance industry in Northern California made it

"WHAT'S wrong with the ironer business?" an age-old question, has at last apparently found an answer in,

"Nothing—if you conduct the right kind of campaign."

For the Electric Appliance Society of Northern California, which has just finished compiling reports and statistics on its September laundry campaign, has announced an almost unbelievable increase of 126% in ironer sales for the campaign month as contrasted with the identical period in 1939. The recipe for success can apparently be reduced to the following simple ingredients:

(1) *the inclusion of both washers and ironers in the campaign;*

(2) the featuring of ironers in a special offer and in advertising;

(3) good industry team work, sincerity of purpose and enthusiasm.

The above ingredients formed the basis of the 1940 laundry campaign. Although the promotion included both washers and ironers, both being given equal emphasis in supporting advertising and publicity material, a special campaign discount of 10% off applied to ironers only—and to ironers of all prices and types, either standard or portable, with the exception of the post type.

Three $25 prize winners of national "Washer and Ironer Week" (there'll be more to come). TOP LEFT—Dean & Hoffman, Long Beach, Cal.; TOP RIGHT—Sterling Furniture Co., San Francisco; BELOW—Palace Dept. Store, Spokane. Others were in Watsonville, Los Angeles and Denver.

Practically all leading makes of washers and ironers participated in the campaign and agreed to promote the entire program aggressively. These makes included A.B.C., Apex, Easy, General Electric, Horton, Ironrite, Speed Queen, Hotpoint, Norge, Simplex, Bendix, Universal, Westinghouse, Kelvinator and Thor.

Chief among the campaign provisions was an agreement on the part of the distributors to provide their dealers with a certain amount of co-operative advertising, at least half of which was to be devoted to ironers.

That promises were kept was evidenced by the amazing amount of advertising, which showed an increase in dollar volume of 69% on washers and 577% on ironers for the month, as compared with the identical month of the previous year. A final check-up revealed that while distributors agreed collectively that they would spend, with their dealers, a sum of $10,000.00 on home laundry advertising, the final amount totaled $15,071.44. This was in addition to approximately $35,000.00 spent by the Society and the utility on various campaign media, such as newspaper advertising, display material, radio broadcasting, a free mat and publicity service and others.

Washing machines, too, showed a healthy increase of 22.8% in sales during the campaign as contrasted with the identical month in 1939. Actual figures were 4,395 washers sold in Sept., 1940, and 3,578 in Sept. of the previous year.

Actual figures on ironing machines were 1,191 sold during the campaign, as compared to 528 sold during the identical month in 1939.

It is interesting to note that unit sales for the month following the campaign remained strictly on the plus side. The figures were 4,030 washers and 836 ironers sold in Oct., 1940, as compared to 3,460 washers and 496 ironers sold during Oct., 1939. A continuation of advertising on a greatly augmented scale over the previous year no doubt was responsible in large measure for this sustained high level of sales.

Distributors reported a marked increase in the sale of new portable ironers during the campaign. They concurred in the thought that these small ironers would provide a valuable means of stimulating interest in ironing machines and future business in larger machines because of their low first cost and the ease with which appliance salesmen could bring them into the prospect's home for demonstration purposes.

Reports from various parts of the campaign territory showed that demonstration was one of the most valuable sales aids. In many places the appliance counsellors of the utility held advance schools for salesmen, which proved most effectual in providing store demonstrators with the type of instruction needed in each individual case.

Reports from dealers and communities throughout Northern California showed a marked unity of opinion on the success of the campaign and its individual features. Some of the more interesting highlights follow:

"The final results show a trend to increased volume, greater dollar value, and a higher unit price of ironers by the small specialty appliance stores. Three times as many small dealers sold ironers during the campaign as compared with Sept., 1939."

"The campaign was well timed and aroused much interest. Many customers remarked on the attractive 'clothesline' which featured the Society's free dealer display material."

"Thanks for the training from the appliance counsellor. This has given us more confidence when we approach a prospect."

"Considering the lack of public acceptance of ironers, dealer interest in this campaign was outstanding and they look forward to another of similar type."

In two small communities demonstrators were provided, with the dealers paying half the cost. Thirteen dealers participated in this promotion at a cost of $1.20 each. For a two weeks' period one demonstrator alone had 135 interviews.

The success of the Electric Appliance Society's campaign comes as a climax to more than two years' effort to find a means of pulling the ironer business out of the doldrums. National interest of the industry was first focused on California in the fall of 1938, when the Society launched its "San Jose Plan," evolved and tried out as an experiment for several months in the community of that name. The plan was featured by home demonstration, a salesmen's bonus and a co-operative advertising plan. The program was abandoned after its experimental stage, due to lack of interest on the part of some of the distributors. There evolved, instead, a slightly modified merchandising plan which distributors were supposed to carry on individually with their dealers. Both of these programs resulted in an increase in ironer business, but not of sufficient volume to appear interesting to the many factors involved.

Refusing to be discouraged and still believing that there was some way to increase ironer sales, the Society tackled the program early last summer, with the amazingly successful results described above—establishing not only a new "high" for sales, but, more important a new realization that ironers really have what it takes for profitable merchandising.

And—in the lowest-income territory—this Edison office didn't forget bulbs, with the result that it succeeded in breaking sales records for the entire system territory

"Local Office Makes Good" is the subject of this success story which concerns the Belvedere office of the Southern California Edison Co. During the month of October, 1940, Claude Elliott, local agent, and his assistant, Miss Wilma Webster, sold a total of $937.32 in lamp bulbs over the counter.

This is a lot of lamps any way you look at it, but the figure seems especially large when it is pointed out that the Belvedere office is located in a region of perhaps the lowest income group anywhere on the Edison system. From 40 percent to 60 percent of the residents are on direct or indirect relief.

"I believe our success was due to two things—inspiration and desperation," Mr. Elliott says. "The inspiration was supplied by H. A. Brody, Montebello district manager; A. I. Whitehead, division manager; and W. L. Phillips, sales supervisor; who cheered us on and gave us valuable selling hints. The desperation part came in when we decided to beat Jess Luke and his gang in the Belvedere Gardens office, who were close runners up.

"We try to keep the office in a neat and orderly condition at all times. But on this occasion we put up a mass display in 'cut-rate drugstore style,' so that our customers couldn't help but see that a lamp campaign was in progress. We made it a point to tell everyone who came into the office about the campaign.

"In handling the sale, we got the attention of the customer at the counter. After regular business had been completed, we picked up a box of lamps

and said something like this: 'Mr. Jones, we are having a special lamp campaign and there has been a reduction in the price on some lamps. For instance, the 60-watt lamps, which were 15c, are now only 13c. We conduct this campaign once a year to encourage better light and better sight. We believe it is more economical for you to replace your lamps as soon as the bowls become so dark that you get only a part of the original light. By moving these into the clothes closets and little-used places and replacing them with new bulbs, you get more light for your money and protect the eyes of your children.'

"Of course if the customer decided to purchase six 60-watt lamps or six 40-watt lamps after having placed this box of lamps on the counter, we would suggest a higher wattage lamp for the kitchen and living room.

"Judging by the low-income classification of most of our customers, it is evident that good lighting no longer is considered a luxury."

Here are the statistics on this outstanding sales record:

Percentage, one sale out of 15 contacts.	
Total monthly collections	18,750
Gross sales	$937.32
Total of individual sales	1,250
60-watt lamps sold	4,158
Over 60-watt lamps sold	1,368
Under 60-watt lamps sold	1,378
Total lamps sold	6,904

Utahans Organize

"To bring about a close cooperation, a better understanding among all electrical appliance dealers and a more harmonious understanding and working arrangement with electrical distributors and to work for better business conditions in general," seventeen electrical appliance dealers of Salt Lake City have organized the Retail Appliance Dealers Association of Utah.

Officers elected at the organization's first meeting, Dec. 9 were W. C. Hollingworth, manager of appliance department of Auerbach Co., chairman; O. Reid Bigelow, vice-president-general manager of the Intermountain Utilities Appliance Co., vice-chairman; Clarence W. Gilner, manager of the Gilner Electric Co., secretary.

An energetic membership committee, headed by Allan M. Baker, manager of the M & M Appliance Co., plans later to extend operations to dealers in all parts of Utah. Meetings will be conducted each month and dealers will, through their combined efforts, attempt to "iron out" their problems.

Bigger Christmas Expositions

Both San Diego and Denver employ novel showmanship to step up the season

"What Brings Them Out?" is the query always made to J. Clark Chamberlain or to George Lewis respectively as the success of each succeeding Christmas Electrical Exposition is told. Both San Diego and Denver again staged highly successful shows and despite flu epidemics and weather, drew bigger crowds and developed more business than at any previous year.

Details of the set-up for the show should be familiar. The answer to "What brings them out" is the news of each occasion.

San Diego's Eighth Show

A "dishpan derby", according to Chamberlain, manager, Bureau of Radio & Electrical Appliances, was one of the main reasons. It was a staged exhibition of the old and new ways of dishwashing from an elaborate stage set-up with two identical kitchens except that one had a conventional sink and the other an electric sink dishwasher and garbage disposal. This was sponsored by George Belsey Co. and the San Diego Gas and Electric Co.

Two clever girls were used in the actual competition of washing an equal number of dirty dishes. Four or five 7-minute shows were held each evening on a special stage with a master of ceremonies to keep up a running fire of talk while the girls were working.

"It was a riot, drawing capacity crowds at all times," said Chamberlain. "Best of all, it really got over the idea. Since the show closed, half a dozen dishwashers have been sold entirely because of this promotion and of course we haven't had a chance really to feel results yet."

Fluorescent lighting, too, was well represented. Five separate displays of this type of equipment, plus two of Neon, were in the show. In that of the San Diego Neon Co., a remarkably fine show of electrical magic was carried on continuously. Through a dark tunnel, fluorescent paint, ultra-violet light and other of the scientific ingredients were blended to create quite a mystifying but practical demonstration, according to Chamberlain.

Here also an operator took very high voltages through his body, shot sparks off his fingers, lighted tubes, signs, etc. from body capacity and in general staged a thrilling demonstration.

"Perhaps our most popular exhibit was one without any commercial aspect whatever," said Chamberlain. "This was the exhibit of the San Diego Model Railway Builders' Club, a group of hobbyists who work with the very small HO gage of electric railway equipment. They had a complete and realistic layout with about 20 trains of one kind and another in operation.

"Only trouble about this was that kids had no chance to see much. At all times from opening until the doors were closed, the adults mobbed the exhibit. It was the first time the HO gage had been publicly shown in these parts and it certainly was a great idea.

"The San Diego State College again entered a splendid exhibit of electric equipment with which they carried on constant demonstrations. Theirs was purely scientific and dealt with various phases of electrical phenomena, dished up so the layman could understand what it was all about.

"As usual, we had a highly representative showing of all the appliances sold in this territory. Had 14 makes of refrigerators, 12 of laundry equipment, 10 of radio, 8 of electric ranges. Although our show opened Dec. 3 amid the worst of our local flu scare, we had the best attendance of all, slightly in excess of last year's record of 110,000. All space was sold out months in advance."

Denver Goes Fluorescent

Advertising a "sensational exhibit of fluid light, beautiful girls garbed in liquid flames, diving girls in waters of fire, the marvels of black light, other entertainment, beautiful electric exhibits," Denver's annual electrical exposition was staged at the Shirley-Savoy Hotel auditorium beginning Nov. 29 and running into the third week of December. Stage shows were held daily from noon to 5 p.m. and from 7 to 10. Sponsor was the Rocky Mountain Electrical League, George Lewis, manager.

Extensive use of fluorescent and black light effects were made in the stage presentations. The showing of merchandise was billed as "An Electrical Gift Preview." With it dealers throughout the region tied in their window displays in order to capitalize on the attention brought to electrical gifts by the exposition.

Appliance Prices Down, Features Up

Kelvinator leads another price dive. All makes report refinements in equipment. Frozen storage comes in. Dealer shows are on now

STILL lower prices on refrigerators and ranges reverse the expectations of the trade in view of the defense raw material situation. Kelvinator, which dive-bombed refrigerator prices at the beginning of 1940 unexpectedly, and caused hurried revision of price lists by all other makes, has announced still lower new prices for 1941.

The fully-equipped 6¾-cu. ft. refrigerator which sold at $139.95 in 1940 will sell at $124.95. The stripped box price will be reduced to $114.75, Frank R. Pierce, general sales manager, announced at the distributors' meeting in Detroit. Kelvinator will have a step-up line of eight models in the equipped class and feature two sizes with eight models in each size. Its deluxe feature includes a "moist master" and "cold mist freshener", completely glassed-in high humidity chamber.

● LEONARD models are very similar to those of Kelvinator, however with different names for the features. Price range is about the same.

● HOTPOINT announces eight new ranges with lower prices, a simplified oven with two units in it, one a Calrod baking unit, the other a radiant type for broiling. Even the thrift cooker now has a Calrod element.

Hotpoint also has new water heaters, especially a 21½-in. 5-gal. water heater to be placed under sinks for individual water heating. In refrigeration, it too features humidity storage and concentrates largely on three 7-cu. ft. models.

The complete kitchen cabinet line is being featured by Hotpoint as well as its dishwasher and sink.

● GENERAL ELECTRIC's sales manager, Carl M. Snyder; A. L. Scaife, merchandise manager, and B. W. Bullock, advertising manager, made a quick tour of the West holding exclusive General Electric appliance distributor meetings at the Fairmont Hotel, San Francisco, Dec. 12, and the Newhouse Hotel, Salt Lake City, Dec. 14. At these a preview of the packaged dealer show, which will be given to dealer meetings throughout the West the first week in January, was shown to the distributors.

Using a novel technique for showing in which the audience revolves instead of the stage, the products shown for each of G-E's various lines are given on a separate small stage about the room.

Center of interest was the new automatic washer and the new refrigerator with storage for 20 packages of frozen food in a 7-cu. ft. model, and an extra gadget, a butter conditioning chamber, as well as humid storage for food needing that type of refrigeration.

● NORGE distributors met at Detroit in mid-December to learn of that company's 1941 line. Dealer showings are scheduled for early January in the various western territories. The new models are especially designed for replacement appeal. Automatic every night defrosting is one of its star attractions.

● WESTINGHOUSE is the first to get in line with the consumer movement in providing informative labeling of all appliances. The new labels will tell all the required specification information and operating cost data asked for by consumers' groups.

An automatic washer and a portable plug-in airconditioner using a reverse cycle refrigeration system are two of the newest things in the Westinghouse line.

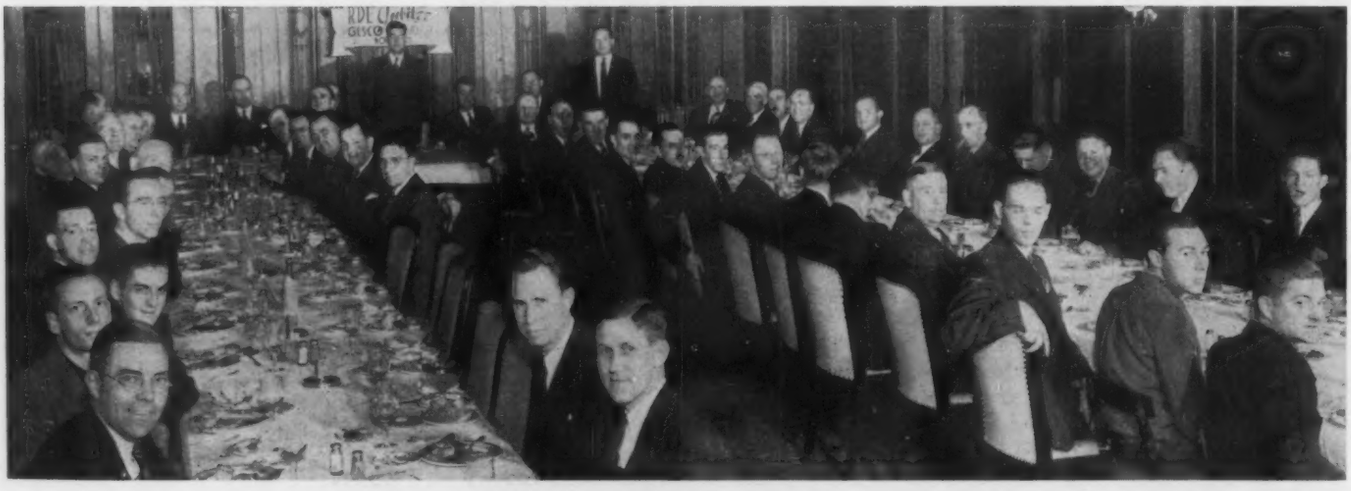
● STEWART-WARNER had its previews in October and placed its 1941 line on the market in time for the Christmas season. Its feature this year is a dual-temperature refrigeration with a freezing locker in which frozen foods may be stored. Its price range f.o.b. factory is low, beginning at $101.95 on the standard models and $189.95 on the dual temperature models.

● GIBSON with a standard model and one with its unique freezer shelf, will have six in the conventional line and six with the freezer shelf. The conventional models start at $89.95 and run to $109.95. Those with the freezer shelf begin at $129.95 on up to $219.95.

Gibson ranges also begin at the low price of $99.95 and run up to $229.95 with a special feature in its cooker well.

● CROSLEY is making even more of its Shelvador. More shelf space is placed on the door with larger egg basket and more bottle storage. Another feature is a cold storage drawer for keeping frozen foods. Showings began in late December.

First annual jubilee of Salt Lake City, Chapter 60, G-E Retail Development League, Nov. 16. Paul Huish, Provo dealer, standing before the emblem, retired as president; Kenneth E. Smith, Salt Lake dealer, as vice president. Sponsored by G-E Supply Corp., Jacob A. Kahn, district manager, Will O. Smith, sales manager, and Deane Miller, welcomed the dealers. That afternoon they attended a big football game before the banquet. Nine prizes were awarded to cap the climax.



ELECTRICAL WEST

Sales Guide

Which is the Business End of an Appliance?

At the end of every appliance is a plug. It isn't the "business end" to the customer, maybe, but it is to you. If there's no outlet convenient for it to plug into, you are apt to have returned merchandise, or no sale. That outlet means more to you than meets the eye.

To you it means more appliance sales,

Less complaints over what you've sold—complaints due to poor voltage.

It means less resistance to future sales.

Turns your satisfied customers, once the outlet is there, into boosters.

It's more fun selling when resistances like inadequate wiring are moved out of the way.

You can do a lot about it too.

Don't say, "That's up to the wireman." He may install, but you are the **salesman.** Maybe he needs your boost to help him sell more wiring.

Your advice to a customer may go far in deciding her to have more outlets installed. When that happens it widens your chances.

So talk up wiring. It's not just a nuisance —it's a real necessity if you are to keep on selling. And there's real satisfaction to you in knowing that you've cleared the road ahead of one of the toughest of sales resistances to future appliance sales.

Stuff you need to know to talk up wiring to your customers isn't complicated. Installing it may be, but talking up the reasons to have it done is simple. It's just sense.

Advise them to go to a good contractor to have it put in. Makeshifts with wiring are not safe. A contractor knows the code rules, has the materials and fittings, has skilled men to install it without wrecking the place or running unsightly cords. Cords only choke up an already gasping wiring system.

Turn inside for a few fast thoughts by which to sell the idea to more customers.

Know Your Stuff about this ADEQUATE WIRING

JANUARY 1941

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Selling is fun

WHEN YOU KNOW YOUR STUFF!

Here's Why

both you and your customer need wiring big enough to do its job through appliances that you sell

Motors can only work as they secure power. Therefore, if motor-driven appliances, such as refrigerators, vacuum cleaners and the like, get only poor pressure from the electric wiring that supplies them, they cannot do the work for which they were intended. Operating below par, they are slow, consume a lot of power which they waste in heat.

Most of the motor burnouts on refrigerators come from overworked motors running continuously at poor pressure (voltage). Operating costs are higher and make your sales story bounce back at you in complaints. Electricity is paid for on a time basis and operation for a longer time, at reduced efficiency, costs more.

The vacuum cleaner not only takes longer but does not draw up the deep dirt.

Besides the inconvenience of trying to find a place into which to plug a floor lamp in an inadequately wired house there is the effect of poor voltage on the light it gives. When you sell a Better Light-Better Sight lamp with a 300 or 500-watt lamp in it the customer expects a lot of light from it.

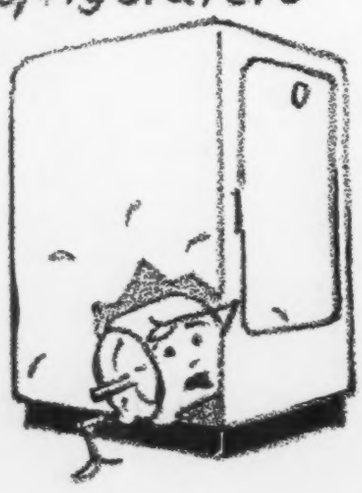
Nothing goes down in efficiency faster than a lamp if voltage isn't good. Drop 10 volts on an overloaded circuit and though the customer pays for full current, the lamp only gives 69% of its rated light.

Sunlamps are even more sensitive to voltage because the beneficial ultra-violet light is only produced when the voltage is about right.

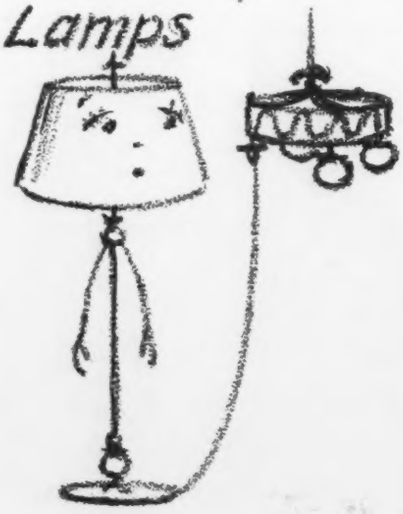
Toasters, coffee makers and other appliances using electric heat are slowed up when the wiring chokes off a part of the pressure of electricity reaching them. Not only that but they consume more power, and do a poorer job.

Operating at 10% below the right voltage 60% more time is needed and 30% more power consumed. Toast is dried out instead of being crisp browned. And hubby may be late to work.

Refrigerators



Lamps



Toasters, etc.,

Iron

Roaster

Range

If there is any single use of electricity which calls for lots of volts quick, it is ironing. That goes for hand irons, automatic irons, and especially for the ironer. In fact, a lot of the grief reported by users of ironers is directly traceable to the inadequate wiring.

In all of these appliances the heating element is buried inside a mass of metal that must be brought up to heat before it can go to work. So first, poor, overloaded wiring slows up the job. By slowing up it takes longer, and uses more electricity.

Where the lost heat goes is along the wire in the walls and in the fuse box. Many a woman, using an ironer, has burned out a fuse, gone to replace it and been frightened to find the entire switch box has been heated up. It makes her fear to use the appliance any more lest it start a fire. What she tells the neighbors about it does not advertise electrical appliances or help sales.

Cure for the complaint that arises from this source is to recommend, and yes, help sell for the wireman, an extra circuit just for the appliances — to the kitchen, breakfast room, laundry porch or basement.

Roasters give the greatest satisfaction to those families whose homes are really well wired. They are a joy to them and they advertise roasters to the world.

But in one city of old buildings and long wires of too small size running from the main floor to high apartments, a roaster campaign was carried on. Sales were fine, but reverts were 40% of the sales. The merchandise was checked and found excellent.

But wiring was too skimpy to deliver enough voltage to heat the roasters properly. Foods simmered instead of roasting or broiling. Flavors were ruined and so were dispositions. And roasters were returned in anger and disappointment. Dealers had **used merchandise** on their hands to be sacrificed.

Any word that you can say to influence your customers to have their wiring improved will remove the possibility of future reverts, losses of sales and customer good will.

Selling a range at an installed price has been the solution to the old time range wiring problem. When the customer contemplated the big additional wiring cost, which usually had to be paid in cash, she often turned away from the electric range. The installed price cures that.

But what an opportunity you have. When a range is sold suggest that when the wireman is doing the job, why not have him run in that extra circuit or two that she has been needing. Done at that time it should not cost so much.

When you persuade a customer to put in more wiring you take out insurance on future satisfaction and sales. Satisfaction with the use of one electrical appliance breeds the desire to enjoy the use of others.

and We'd like you to Succeed at it!

PUGET SOUND POWER & LIGHT CO. • WASHINGTON WATER POWER CO. • PORTLAND GENERAL ELECTRIC CO. CALIFORNIA OREGON POWER CO. • UTAH POWER & LIGHT CO. • IDAHO POWER CO. • THE MONTANA POWER CO. • ROCKY MOUNTAIN ELECTRICAL LEAGUE

"Stuff" to Know

What you CAN do about wiring---

Drop hints whenever you get a chance. Just simple ideas that people will agree with and continue to think about. Flash them in conversation, in sales talk. Put them in your store ads. Make up window cards of them. Paste or print them on sales tags. Repeat the idea often. Ideas such as this—

Your appliances won't heat quickly if they aren't fed properly. It takes good sized wires to give them what they need quickly.

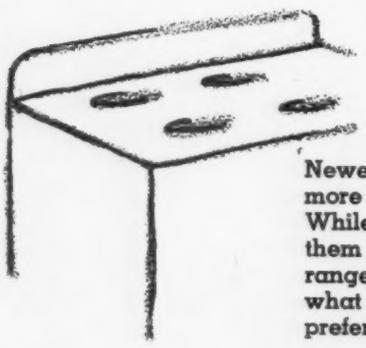
Watch that "thief in the wire." Too small wire takes its toll day in and day out on your electric bill. You only get your full dollar's worth of quick electricity when the wire is adequate.

You pay for electricity at the meter. The electricity is strong and healthy there. Why let it waste itself pushing its way through too small wire before it ever gets to the appliance to go to work for you?

Your home will have better resale possibilities if it is wired for convenient and abundant electrical living.

Your appliances are designed to give you so much pleasure and service. When tested at the factory and by laboratories they performed as they were meant to do. Good wiring will see that you get that pleasure too.

In your contacts with customers use the booklets and pamphlets of the National Adequate Wiring Bureau. The local utility probably has them or can get them for you.



Keep Yourself In Range---

Newest models have still more automatic features. While they are NEWS, make them the punch of your range sales talk. They are what make electric cooking preferable and superior.

Air Heat is Hot Now

Bring out the electric heaters—the season for them is here. Remember all the special appeals they have—**(1)** Instant heat to take away the chill. **(2)** Additional heat when the weather gets too cold for the furnace. **(3)** Saves starting the furnace in spring and fall when little heat is needed. **(4)** Don't have to store fuel for it, the power company does that. **(5)** Easily carried to where the heat is specifically needed. **(6)** Sturdy, never wears out, if it's a quality make. **(7)** Healthy heat, perfectly safe, even in closed rooms. **(8)** Dozens of special uses from drying the hair to thawing frozen pipes, vaporizing croup inhalations, or raising bread.

So are Sun Lamps

Weather forecasts all say it will be a long, cold winter. That means folks will starve for sunshine. The electric sunlamp is a real lifesaver in this situation. Here are reasons to tell people why they should buy: **(1)** Helps the healthy to stay well, builds up their resistance. **(2)** Supplies missing sunshine during winter month. **(3)** Easier to take than outdoor sunbaths for most people, especially those employed in daytime. **(4)** Quality is always uniform, whereas with sunshine you can't be sure. **(5)** Relaxes and refreshes, promotes healthful sleep.

"Stuff" to do

Market Week

Nance of Easy and Snyder of G-E to address dinner

Following closely upon the individual manufacturer dealer showings, many of which will be held in the Mart itself, the 51st market of the Western Furniture Exchange and Merchandise Mart in San Francisco will open the week of Feb. 3. Two floors of the Mart concentrate the sample displays and showings of the majority of appliance manufacturers and distributors. Numbered among them are Frigidaire, Kelvinator, General Electric, Norge, Crosley, and Westinghouse.

General Electric reentered the Mart with a new display space lighted in fluorescent lamps, and established a new precedent by holding dealer showings entirely at the Mart.

Washing machine manufacturers exhibiting include Easy, Thor, Speed Queen, Horton, Conlin, Bendix, Blackstone, Apex, as well as G-E and Westinghouse.

High point of the week in the radio and appliance trade is the informal no-host trade dinner to be held Feb. 5 at 6:00 p.m. For this Harry A. Strong, executive vice president, Servel, Inc., will be general chairman. J. J. Nance, general sales manager, Easy Washing Machine Co., Syracuse, and C. M. Snyder, assistant manager, G-E Appliance and Merchandise Dept., Bridgeport, will be the two feature speakers.

For the dealer the Mart concentrates in one buying center a closed display area at which he can contact the major suppliers of furniture, floor coverings, radios and appliances, housewares, lamps and gift wares, curtains and draperies, linens, domestics and beddings. It gives him an opportunity to judge trends, compare competitive makes and qualities, save time and expense in his buying, as well as meet associates in the industry from other regions than his own and compare information and business conditions.

"The threat of higher labor and material costs with the present and impending scarcity of raw materials and shutting off of many foreign sources of supply," says George L'Amoreaux, in charge of the appliance division of the Mart, "makes it necessary for every dealer to look ahead more than ever before."

● AMERICAN STANDARDS ASSN. has disclosed htat it has received a request for the development of an American standard for domestic electric flatirons from the National Electrical Manufacturers Assn. Some work has already been done by NEMA upon such standards which will include definitions, methods of tests on flatirons, performance characteristics, durability, safety, ratings, name plate markings, and informative labelling.

Donald Rides Again

Famous Duck reenlists to carry water heater campaign

Donald Duck returns to the electrical merchandising scene again this year, this time accompanied by his three noisy nephews, as The Modern Kitchen Bureau points its 1941 program for dealers towards the greatest year in history in the sale of electric water heaters.

The Bureau's new campaign, put together with the theme of "Electric Water Heater Jubilee," points out that 1940 saw more electric water heaters sold than any previous year and that with definite and established consumer acceptance of the electric water heating idea, 1941 offers dealers, utilities and manufacturers alike their greatest opportunity for profit.

A new idea on the 1941 spring promotion is the radio program which will give utilities and dealers a medium that has long been needed to advertise electric water heaters. Made up into a series of sixteen 1-minute water heating "ads" using song, verse and dialog, the whole thing goes on a transcription using professional talent and big-time radio announcers. No brand names are carried on the discs, as the whole idea has been worked out to sell the service of electric water heating and allow time at the end of each announcement for the dealer to tie in his own name and brand by local announcers.

Another prominent feature of the new campaign is a series of carefully worked out newspaper ads, mats of which will be made available to dealers. These ads are more flexible than last year and are written from a strictly local standpoint in order to work to the best advantage of dealers. Disney art is used, thus giving dealers the added attraction of some of the most popular characters of the day.

Thirteen major manufacturers created and are supporting this MKB program.

A "Jubilee Jackpot" of prizes to utilities and dealers has been provided for window displays, floor displays and the best over-all job in 1941 among utilities. Two thousand dollars in cash prizes are put up by the Bureau.

Title of the Bureau's spring electric range campaign for 1941 will be "The He-Man Recipe Round-Up." With the slogan of "Switch to Switches," the entire promotion will be developed on the general theme of cooking contests for men as local promotions.

● FIRST WATER HEATERS, then ranges will be made the focal points of an industry-wide campaign in southern California as the result of preliminary negotiations now being carried on by all of the utilities, both private and municipal, and the manufacturers and dealers in that area. The water heater campaign will be launched in January and February, the range campaign in March. Uniform practices, premiums, wiring allowances and a coordinated advertising drive are to be part of this program.

● GONE ARE THE DAYS when the wife's place was in the home. When Roy McBee, Hotpoint dealer in Pateros, Wash., wants to put across a promotion, he employs his wife as top salesman. Mrs. McBee is very enthusiastic about selling and demonstrating electric merchandise. She frequently finds some way to make an effective display or demonstration.

Recently, during the promotion of the electric ironer, Mrs. McBee decided to demonstrate forcefully what could be done with this piece of equipment—and promptly announced that she would willingly iron anybody's family wash for demonstration purposes.

Campaigns

With the rush of business over, many territories are taking a breathing spell for inventories, clearance sales and new appliance showings. However, some campaigns are being planned for the near future.

Nevada-California Electric Corp.—a washer and ironer campaign for both January and February.

San Diego Gas and Electric Co.—just finished a spectacular Christmas season with participation in the Electrical Exposition. Plan range, water heater and heating pad campaign in January.

Puget Sound Power & Light Co.—in addition to dealer Christmas appliance campaign, had "Alice in the Electric Wonderland" cooking schools in its territory during December. It begins its new dealer plan in January.

Utah Power & Light Co.—Subsidiary companies and dealers plan stock clearance sales in January with emphasis on radios and sunlamps. February, radios, sunlamp, portable lamps and fixtures.

British Columbia Electric Railway Co. will introduce its 1941 dealer plan during January. Very few changes from the 1940 program.

Pacific Gas & Electric Co.—Electric Appliance Society conducted very successful Christmas campaign on appliances featuring "Smart Giving." Plans are under way for a big range campaign in March.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO

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Blueprint of 1941

BEST New Year's card for the electrical industry here in the Far West would be a blueprint charting the 1941 business outlook. It would show the rising curves of the past few months headed upward to new heights, which will not be reached until next fall or even later. Neither a Sibyl nor an Apollo would be needed to interpret the curves into rising power demands, more business for contractors and wiremen, increased appliance sales for dealers and new peaks in sales volume for wholesalers and manufacturers.

Basis for this promising outlook is the superimposition of the national defense program upon what was already an expanding business cycle. For the whole U. S. the defense program for materials alone adds up to $10,000,000,000 for ourselves and $2,500,000,000 for Great Britain. It includes such items as 50,000 planes, 130,000 engines, 17,000 heavy guns, 25,000 light guns, 13,000 trench mortars, 33,000,000 shells, 9,200 tanks, 300,000 machine guns, 400,000 automatic rifles, 1,300,000 regular rifles, 380 warships, 210 merchant ships, 40 new factories and clothing and supplies for 1,200,000 men. Upwards of 18 per cent of this business has been placed in the Pacific Coast states. Expressed into dollars this means more than $725,000,000 for aeroplanes to be built in Coast plants and in excess of $700,000,000 of ships to be constructed in Coast yards. Both of these figures can be translated into kilowatt-hours and electrical supplies and material.

However, this does not complete the picture. More than $130,000,000 of new construction has been authorized here in the West as part of the defense program. Included are cantonments, bases, yards, airports and other works. Many are under construction, other parts are still in the planning stage. Coupled with this is a housing shortage of major proportions. This is estimated at $700,000,000 for the country as a whole, with almost 20 per cent of it in Far Western communities.

Important too will be the increase in buying power which all of this portends. Workers will have money to spend for ranges, refrigerators, laundry equipment and other appliances. This coming year can be a record one for electrical retailers.

On the whole the 1941 blueprint of business prospects is an imposing document. It has some drawbacks, however. There will be a lot of taxes. One could wish for greater stability of the business in sight. There could be more government regulation of business. The political yoke could be lifted from the necks of the utilities. And finally there will have to be some forthright and realistic planning for the years ahead when the impact of the defense business is no longer acting on our internal economy.

Basing its plans on the blueprint, the electrical industry may be sure that whatever tomorrow may hold or hold back, it can proceed aggressively, determined to carry its share of the work and earn its share of the reward.

Dick Smith

IT always was appropriate that one of the first ways in which the electrical industry in California became aware of Dick Smith was as a sort of electrical Will Rogers. The same bashful, kindly humor, the same earnestness underlying it, characterized both men. And the same level-headedness too.

Richard E. Smith of Southern California Edison Company, after too short a life, passed away Dec. 8, to end too long a lingering illness. Into that life, it seemed to his friends, was pressed far too much anguish and personal sorrow, more than comes to most men. This was hardly even admitted by this quiet man, but doubtless it gave depth to his warm humanity, his friendship.

Dick Smith is a common name, and this particular Dick Smith was an uncommon common man. He was uncommon in his human qualities. When he touched a convention, for instance, he

made it meaningful and human. It is to him that the PCEA owes its direction in so much of its employee information and public relations activity. He was to have done the same for next year's convention at Coronado. It was at Coronado, at the convention of 1924, that he appeared as Will Rogers.

Although one hardly knew he was present, so unobtrusive he was, Dick Smith will be missed greatly. He will be missed in ways that are hard to voice. He will be missed by all who came within touch of his gentle nature. The industry itself will miss his guidance, whether it is or ever was aware of it. His influence was there quietly at work. That influence is bound to be reflected in the deeds of those who worked with him, and thus they may carry on as he would carry on if he might.

Blackout Factories

OUTGROWTH of national defense is the Army's interest in possible blackout provisions for both new and existing factories engaged in the production of war material. Should this interest express itself in a trend or in actual specifications, the electrical industry would find itself confronted with the task of designing highly efficient and well-nigh perfect lighting and air-conditioning systems.

Up to the present time the windowless factory, pioneered by Simonds Saw & Steel Co., has been something of a fad although there have been potent arguments in its favor. Ability to control light, air, temperature and humidity have been plus factors that were essential and economical in some industrial plants. However, the introduction of the fluorescent lamp has given impetus to blackout construction because its lack of heat permits great reduction in the air-conditioning capacity.

From every electrical standpoint the new windowless factory is practicable. Starting from scratch the industry can light and air condition it to any degree demanded. If and when it should become necessary to provide blackout facilities for existing key defense plants, that would be an altogether different problem. When one looks at the aircraft factories in this Western area and considers the difficulties that blackout remodeling would entail, it is conceivable that complete electrical overhauling would be necessary. Certainly major rewiring would be required to provide light and air-conditioning capacity.

Ultimate extent of blackout facilities is today problematical. However, the electrical industry should be ready to assume its share of the job if the time comes for more general demand for this kind of construction.

Politics or Defense

BEFORE the conclusion of the FPC investigation of alleged political expenditures of Northwest utility companies, some pertinent testimony became a part of the record. Statements were made by Paul B. McKee, president of Pacific Power & Light Co., and Frank McLaughlin, president of Puget Sound Power & Light Co., justifying the expenditure of utility funds for defense against attacks by proponents of public ownership. Both classed such expenditures in the same category as insurance. Both made vigorous cases for the right and obligation of a private corporation to defend itself against takeover by a governmental agency. In fact the arguments they presented should be read by every voter in the territories served by their respective utilities. Had the stories been sufficiently well known, it is doubtful if some of the PUD's would ever have been voted. Mr. McKee sounded a warning to other utilities when he said, "Looking back over the last six years, it is something of a source of regret that we did not put up a harder battle and spend more money getting our story to the people."

LET'S sit down with those charged with administering the law and work out programs for accomplishing as much of our job as we can in conscience under existing law. I believe that this approach will work out many more of our differences than we now think possible. And if it develops that we cannot thus resolve all differences, then at least Congress and the responsible government officials will know that the difficulties which remain have not been exaggerated by industry. Such cooperation between industry and government should quickly add to the effectiveness of both legislation and administration.

In the past there has been a tendency to exaggerate the differences between industry and government with respect to existing legislation. If we place greater emphasis upon the common objectives of government and industry and upon their points of agreement, I am convinced that the differences, seen in their proper perspective, could soon be reconciled, and that the purposes of government as well as the needs of the industry could be better served.—Leo. T. Crowley, chairman and president, Standard Gas & Electric Co., and former head of the Federal Deposit Insurance Corporation.

NEWS of the industry

ELECTRIC HEADLINES AS DECADE 195 BEGINS

No sabotage

Newspaper headlines notwithstanding, no wave of sabotage is sweeping the country. Recent sensational explosions and other mishaps have been reliably cleared of deliberate origin, reports the McGraw-Hill Washington Bureau.

FBI is continuing its steady policy of precautionary work, directed at protecting manufacturing plants and utilities against outrages, and already has nearly completed formal, detailed studies of more than 1,000 plants which the Army and Navy asked to have inspected.

The FBI's handbook for sabotage protective measures is essentially a program of watertight details, looking out beforehand for the little things. Its broad recommendations are relatively simple, such as complete fencing, a limited number of guarded gates, floodlighting (particularly of essential units), investigation and control of personnel. More on page 69.

And none is wanted

President Roosevelt has signed the bill which makes the Federal sabotage and espionage laws of wartime applicable to the present emergency. The new law provides fines up to $10,000 and 10 years in prison for acts against the defense program. Utilities supplying power to customers engaged in defense work are covered by the scope of the measure.

Fluorescent prices down

As though fluorescent lighting needed any further impetus, both G-E and Westinghouse announced substantial reductions in the price of type F Mazda lamps effective Jan. 1. Average list prices of fluorescent lamps have been reduced 50% in the last two years. New prices of daylight and white tubes: 15-watt (18-in.) 85c; 20-watt (24-in.) $1.10; 30-watt (36-in.) $1.10; 40-watt (48-in.) $1.60; 100-watt (60-in.) $3.50.

FPC's hearings

Speculation as to after-effects of the FPC hearings on alleged political expenditures of five major Northwest electric companies leads to several interesting possibilities: (1) The testimony introduced will be used when Congress begins consideration of additional legislation affecting Bonneville and Grand Coulee, notably the Bone-Leavy or Columbia Power Administration bill. (2) Legislation may be proposed to Congress regulating political expenditures of all classes of utilities. (3) Some attempts may be made to broaden future hearings to include testimony relative to expenditures of proponents of public power measures. (See page 64).

More rural projects

REA money continues to pour westward. Of $1,544,000 in allotments announced in December, Oregon cooperatives figured prominently with one cooperative receiving $595,000 to build and acquire 352 mi. of line, another receiving $125,000 to build 43 mi. of 33-kv. transmission (see p. 70).

Expansion in LA

Equipment totaling $500,000 was on order by the Bureau of P&L, Los Angeles, in December. Allis-Chalmers was awarded a $367,200 contract for high-voltage transformers; Kelman Electric & Mfg. Co., $186,662 for oil circuit breakers. A $71,072 wire order went to Anaconda.

Negotiation in SF

Subject to the broad terms outlined in Plan E which Interior Secretary Ickes approved, officials of San Francisco and the PG and E are working out details of the Hetch Hetchy lease. San Francisco seeks assurance that its net profit under the lease of actual distribution facilities will at least equal the $2,500,000 return under the 15-year old agency agreement. It also looks askance at the flat $4,900,000 annual rental, which Ickes pointed out might preclude future rate reductions.

Appliance debut

New model time in the appliance field is here. Received too late for detailed description in this issue were data on Hotpoint, Kelvinator, Westinghouse, Crossley, and other products. Some significant highlights (details next month): Informative labeling, a new automatic washer and a reverse-cycle air conditioner by Westinghouse; a 6-ft. equipped refrigerator at $124.95 (Eastern zone) compared to a price of $135.95 last year by Kelvinator; eight new range models at new price levels by Hotpoint; and several refrigerator refinements by Crossley.

Speed NW line

Pushing toward completion within five months of the day work started, 300 men are at work on the 280-mi., 161-kv. transmission line from Grace, Idaho, to Anaconda, Mont. Completion is due Feb. 15, thus strengthening the interchange capacity of the Montana, Utah and Idaho systems.

The Anaconda-Grace line consists of wood-pole structures on 700-ft. spans, carrying ¾-in. hollow copper conductor. This, incidentally, is a product of the Anaconda wire mill at Great Falls.

Meanwhile Montana Power announced completion of a 100-kv. line between Harlowton and Billings.

Defense power shortage?

Whether or not the FPC report to President Roosevelt on defense power had political implications, as some contend, work was being rushed on facilities in the two Western areas alluded to in the report as possible regions of power shortage. In Idaho, Utah and Montana workers braved severe snowstorms as they set poles and strung wire on the 161-kv. tie-line joining utilities in those three states. In central and northern California plans were being readied for dedication of the first of three 35,000-kw. steam plants by PG and E while work proceeded on the 150,000-kw. interconnection with Southern California Edison Co. (Read page 62.)

Bonneville grows again

Bonneville generator No. 3, rated at 54,000 kw., went into service Dec. 23, bringing installed capacity to 150,400 kw. Unit No. 4 will be in service in a few weeks, No.'s 5 and 6 are being installed and the final four are in order. When completed the plant will have a capacity of 518,400 kw.

Principal customer is Aluminum Co. of America whose Vancouver, Wash., plant will ultimately purchase 162,500 kw. at $17.50 per kw.-year. Administrator Raver has executed contracts for 218,532 kw. of prime power, with Aluminum Co. and Portland General Electric, the two big customers. Balance of power contractors are small, mainly municipalities and PUD's, many of which are not operating.

Sacramento District Calls Bids on Block of Bonds

Taking advantage of a favorable bond market, the Sacramento Municipal Utility District last month called bids for $300,000 of its power bonds. The district hopes for sale on the basis of 1½% interest rate, possibly 2%.

Purpose of the sale is to finance further condemnation proceedings against Pacific Gas and Electric and preliminary surveys and construction. This is part of a $12,000,000 issue voted in 1934.

Scheduled for resumption Jan. 8, are hearings by the California Railroad Commission. PG and E men are expected to be cross-examined as to the reproduction - cost - new of properties being condemned.

Farm Uses for Power Studied by Bonneville

A five-fold survey and research program for the purpose of determining how Columbia river power can best serve Pacific Northwest agriculture is planned by the Bonneville Power Administration.

The survey will be the administration's third major activity in its general planning program which is aimed at providing detailed information relative to power needs and uses in all Northwest communities. Two other surveys, one concerning Pacific Northwest industrial sites, and one involving potential development of Northwest mineral resources through the use of low cost power, already are underway.

Administrator Paul Raver said that a special staff unit has been set up which will prepare reports upon the extent, nature and trend of agriculture in all sections of the Northwest region. The new unit will maintain a close cooperative relationship with all local agricultural agencies, and will be responsible for analyzing and reporting to farm and other interested groups on existing and potential applications of electric power to farm operations, and to the processing of farm products.

Sierra Pacific Power Has a New Manager

Manager of Sierra Pacific Power is Frank A. Tracy, whose promotion to that job from assistant manager was announced just before Christmas by Vice-President H. A. Lemmon. Tracy's association with Sierra Pacific is comparatively recent; immediately prior he was for three years personnel director of Stone & Webster Co., New York.

45,000 INSULATORS of 10-in. porcelain have been delivered to Westinghouse for the Montana-Idaho-Utah interconnection. Here is high-frequency, high-voltage test on part of the $70,000 order. A third of them were made at Emeryville, Calif.

He graduated from the University of Maine (B.S. electrical engineering) in 1919, joined Stone & Webster's statistics department, went to Puerto Rico for two years with Ponce Electric, then joined Blackstone Valley G&E, R.I., where he spent 12 years in various capacities, last as assistant to the president.

● BLACK CANYON POWER is the subject of a petition now in the hands of Secretary of Interior Ickes. The petition asks that power from the Black Canyon plant be made available to the city of Emmett and other agencies for municipal systems. Black Canyon power goes to Idaho Power Co. in exchange for certain services it renders the Bureau of Reclamation.

Puget Sound Pays on Debt to Stockholders

Completing payment of dividends accumulated up to July 15, 1935, on its 110,000 outstanding shares of $5 prior preference stock, the Puget Sound P&L will disburse $1.25 a share, or an aggregate of $137,500 on that stock on Jan. 15. It is explained that this still will leave accumulated but unpaid dividends of $27.50 a share, as of next Jan. 15, against such stock. Company officials state that these deferred dividends must be taken care of completely before any can be paid on Puget Power's $6 preferred stock. At present the accumulated but unpaid dividends against the $6 preferred stock amount to $48.50 a share. The $5 prior preference stock is accorded a redemption value of $110 a share, or a liquidation value of $100 a share, plus accumulated dividends. The $6 preferred has a redemption value of $125 or a liquidation value of $100 (subject to rights of the prior preference stock) plus accumulated dividends in either case.

Havenner Appointed to California Commission

Appointment of Frank R. Havenner to a six-year term on the California State Railroad Commission has been announced by Governor C. L. Olson. Defetated in the last election for his Congressional seat, Havenner is a former San Francisco supervisor and at one time ran for mayor of that city. He has been a staunch advocate of municipal distribution of Hetch Hetchy power and while in Congress was a member of the "public power bloc."

● MAHLON E. NEWLIN, 62, for 22 years with San Joaquin L&P Corp., died Dec. 18 in a San Mateo, Calif., hospital. Newlin moved with his family to San Mateo in 1936, a year after he had suffered a stroke. His home had been in Fresno, subsequent to 1904, when he came west from Kansas, where he was born.

● GRAND COULEE BREAKER AWARD—to G-E for $301,080.

EXTRA LIGHT BY DAY is provided at the entrances of these twin-bore tunnels which form the western approach to Seattle's pontoon bridge. Sixteen 16,000-lumen mercury lights enable drivers' eyes to become accustomed to tunnel illumination upon entering. Tunnel lighting is sodium; night floods (above) are incandescent.

FPC Thinks West Is Short on Power Capacity

When Leland Olds, FPC chairman, put the finger on two Western regions as possible areas of 1942 power shortages for defense needs in his newly instituted reports to President Roosevelt, power engineers in this region began an immediate study of power resources and power demands. Olds' statement included Idaho, Utah, northern California and southern Oregon as areas where deficiencies in power supply might develop in 1942, saying that the aggregate shortage for the nation might approach 1,500,000 kw.

Utah and Idaho utilities gave immediate assurances that completion early in 1941 of the 161-kv. tie-line between Grace, Idaho, and Anaconda, Mont., would provide ample capacity in advance of any possible emergency. The line will interconnect the systems of the Idaho Power Co., Utah Power & Light Co. and Montana Power Co., giving the first two utilities the benefit of present large Montana surpluses as well as additional supplies from the Pacific Northwest power pool into which Montana Power is tied.

A sucession of dry years coupled with new peaks in both capacity and energy generated indicated the need for additional capacity for Utah and Idaho. Because several irrigation projects in Idaho and Utah are in the preliminary stages and because their success will depend upon finding a market for power to be developed therewith, the companies determined that interconnection was the best means of meeting present requirements. Under normal precipitation conditions, the existing facilities could supply an abundance of power.

Northern California's power supply will be augmented in the near future from a number of sources, chief among which will be the three 35,000-kw. steam plants being built by Pacific Gas and Electric Co., along the shores of San Francisco Bay and the 150,000-kw. interconnection between PG and E and Southern California Edison Co. which will be completed next summer. In addition PG and E just announced the construction of a 28,000-kva. hydro plant at Dutch Flat on the Bear River. More capacity also can be developed on some of the existing PG and E projects.

Now pending before the FPC are applications for licenses for a series of hydro plants on the Feather River construction of which PG and E authorized two years ago. Granting of the licenses was opposed by the California Water Authority on the grounds that such power might interfere with marketing Central Valley project power. FPC initially denied the application for the licenses without prejudice. In the meantime amended applications were filed for the Cresta and Pulga plants of 68,000 and 80,000 kw. respectively. Action on the applications may be announced some time this month.

The FPC report on power shortages showed a net assured capacity of 245,500 kw. at the end of last September in Utah and Idaho to serve a September peak load of 221,000 kw. and an estimated maximum peak during the next twelve months of 245,600 kw., occurring in August, 1941. Required reserves were estimated at 35,000 kw.

For northern California and southern Oregon the report showed net assured capacity as of last September of 1,187,575 kw. to serve a peak load of 1,181,066 kw., with a required reserve estimated at 76,000 kw. The report indicates an assured capacity of 1,394,575 kw. at the end of 1942 but does not show an estimated peak load for that year.

General NW Power Program Discussed by Planners

The Bone-Leavy bill for the creation of a Columbia Power Administration, now in Congress, came in for preliminary informal discussion by the Pacific Northwest Planning Commission at its meeting in Portland Dec. 3. Members of the Commission, who are appointed by the governors of the states of Oregon, Washington, Idaho and Montana, brought out points in which the Bone-Leavy bill deviated from the principles which should be embodied in a permanent power authority bill for the Pacific Northwest enunciated by the Commission some years ago.

One of the main points of difference was in the fact that the Bone-Leavy bill provides for the centralization of authority over the CPA in a department of the government, whereas the Commission's previous report stated the principle that any authority of this sort should have a policy-making board of directors or other similar body composed of people living in the region affected who would presumably be more responsive to the economic and social needs of that region and to the wishes of the people residing in it.

No action was taken by the Commission at its Dec. 3 meeting except to suggest further study of this bill with a view to reporting later.

Earlier in the day, the Planning Commission and a number of interested persons heard David Lilienthal, TVA director, speak on the accomplishments of the TVA at an open forum meeting at Reed College, Portland. Lilienthal said TVA represents "a specific workable way to avoid the dangers of remote and over-centralized government. It is a means of bringing the national government closer to the people and the regions of America to give them a greater voice in the national government."

● TACOMA CITY LIGHT plans to spend $60,000, to provide four 5,000 kw. transformers, to increase Fort Lewis service to 16,000 kw.

Salt Company Signs For Bonneville Power

Delivery of 2,000 kw. of Bonneville-Grand Coulee power to the Pennsylvania Salt Mfg. Co. of Washington for use in a sodium chlorate plant to be established in Portland, Ore., is assured with the signing of a 20-year contract. The company, a subsidiary of the 90-year-old Pennsylvania Salt Mfg. Co., will begin construction immediately.

The Salt Company will purchase its major power supply from the power administration. Power for lighting will be purchased from Northwestern Electric, which will also transmit the federal power to the plant, under a separate agreement.

Completion of the company's plant is scheduled this year, when deliveries of 1,000 kw. will begin. Deliveries will be increased by 200 kw. per month until 2,000 kw. is reached.

The Salt Company plans to obtain the salt it will use for raw material from California and Tacoma.

Conflict in Views On PUD Financing

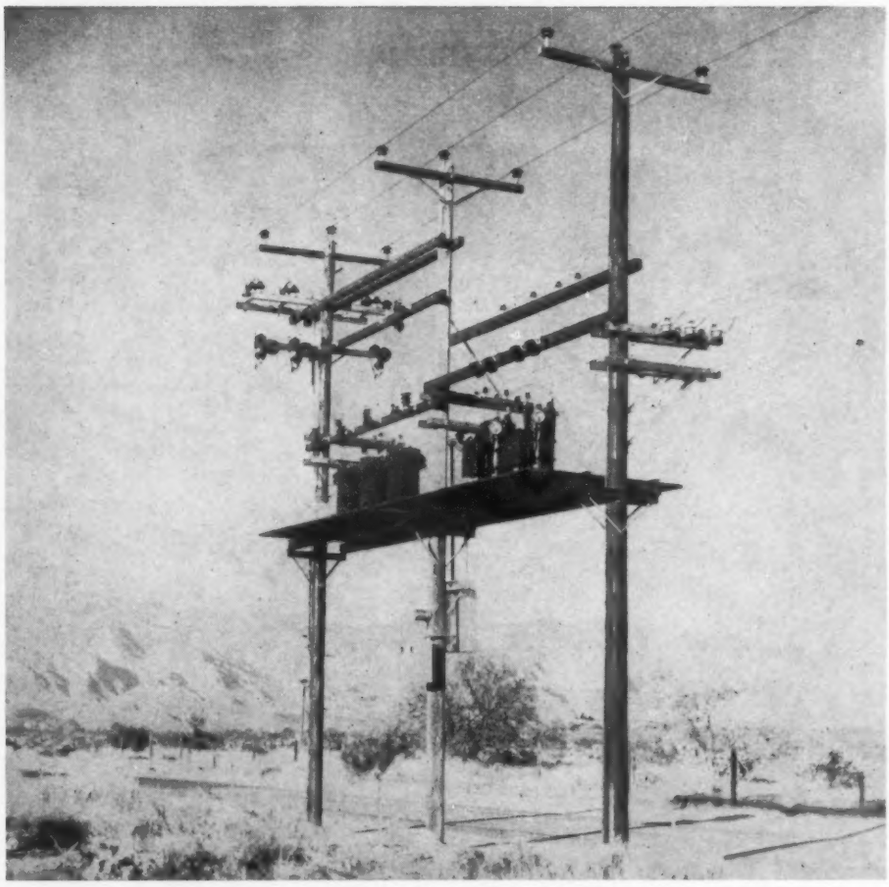
Whether acquisition of Pacific P&L properties by PUD's in its territory in Oregon and Washington shall be financed by John Nuveen & Co. and associates, or through RFC with Bonneville Administrator Paul Raver as negotiator, was debated Dec. 17, in a public meeting of the district's commissioners at Goldendale, Wash. Opinion was divided and no decision reached.

The meeting was called by the Columbia Valley Public Power Corp. This is a non-profit corporation under Washington law. PUD's in the territory served by Pacific P&L are members of the corporation.

During the discussion, C. L. Marlett, executive assistant, Bonneville Administration, said Bonneville did not favor the type of financing recently undertaken by Cowlitz County PUD with the Nuveen Co., wherein there was a 7.1% average spread between the price paid the PUD and the price asked of ultimate purchasers of the serial revenue bonds—although the PUD's average coupon rate was only slightly more than 4%.

Nuveen representatives said this was due to unusual expense in this financing and to unusual risks. Among the latter they gave: the high price paid for the private company's properties; the fact that 70% of the district's business depended on two large industrial customers; the fact that Bonneville had notified the PUD just prior to the financing that it doubted that a power contract could be made if the proposed financing was undertaken.

Bonneville's attitude so far in the Pacific negotiation met with criticism by several PUD commissioners. J. R. Forden, Hood River County PUD commissioner, said: "If we have come to a point where we must look to the Federal government to dictate everything we can and can't do, it is time we examined the Bill of Rights to see if we have any state and local rights left."



DESERT SERVICE is required of this substation built by Tucson GEL & P. Furnished by G-E were 13,800/24,000-volt transformers and induction regulators

Seattle City Councilmen Propose Washington Grid

Seattle city councilmen have disclosed one pattern for a proposed government power grid in Washington. Plan hinges on possible purchase of complete system of Puget Sound Power & Light Co., now being studied by Bonneville Administrator Raver. As described by Seattle officials details include: (1) Formation of statewide government owned and operated system for power production and transmission, sponsored and financed by federal agencies cooperating with PUD's and municipalities. (2) Pooling of Bonneville and Grand Coulee power with that of Seattle and Tacoma municipal plants together with others to be acquired. (3) Retail distribution reserved to municipalities and PUD's with distribution systems acquired to be sold to them. (4) Creation of over-all government corporation by means of Congressional enabling legislation for accomplishing program outlined.

Puget Sound's President Frank McLaughlin commented by reiterating position announced last October: "On Sept. 23 the Bonneville Administration stated that they desired to present a workable plan, backed up with evidence of ability to perform, covering acquisition of the Puget Sound Power & Light Company. . . . Consistent with our past policy we advised that we would furnish such essential information as would be necessary . . . provided satisfactory moratoriums were made as to condemnation suits. The latter has been done and essential information is being furnished. Such is the status of the matter at the present time."

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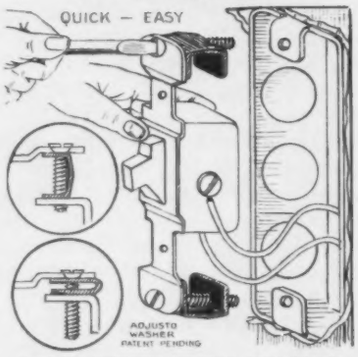

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FPC Ends Its Hearing, Will Report to Congress

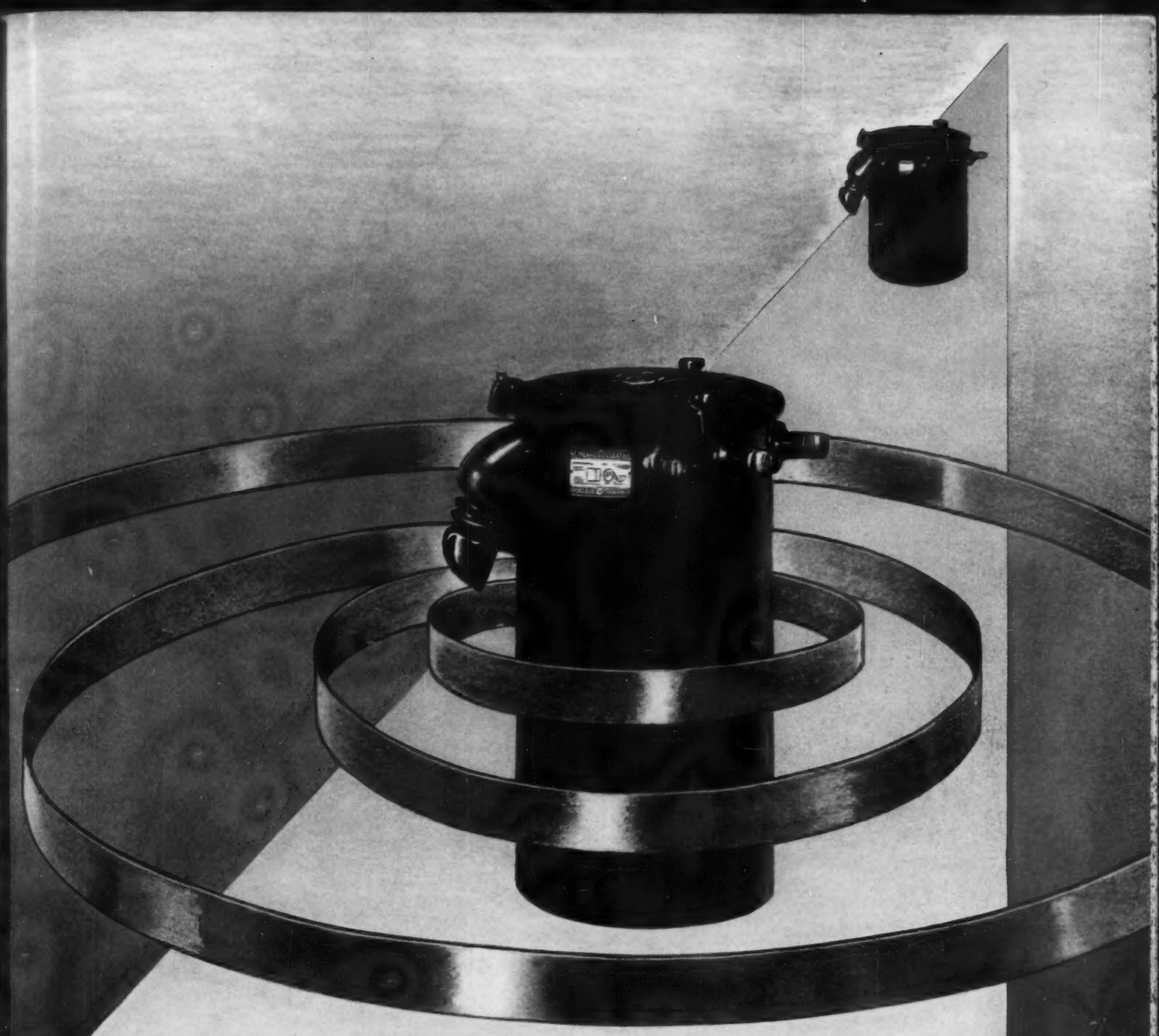
FPC's investigation into alleged political activities and expenditures of five Pacific Northwest electric utilities, begun prior to the November elections, was concluded Dec. 17 in Los Angeles. Trial Examiner S. H. Crosby transferred hearings to southern California to take final testimony from President Frank McLaughlin of Puget Sound Power & Light Co., who was recuperating from illness.

Before it concluded, the investigation succeeding in uncovering nothing not previously known or recorded regarding the efforts of Northwest companies to protect themselves from attacks of government ownership proponents. Publicity given to the hearings prior to the election appeared to have had the effect desired by those who initiated them, namely the defeat of Initiative 139 which would have forced Washington PUD's to submit revenue bond issues to public vote.

Introduced into the record were exhibits showing hundreds of pages of typical public ownership publicity, as well as examples of various pamphlets, booklets and other material produced by various organizations promoting PUD's. Attempts of attorneys representing the utilities to subpoena leading public ownership proponents, including Dr. Paul D. Raver, Bonneville Administrator, Dr. Carl D. Thompson, head of the Public Ownership League of America, and various Grange leaders, and thus broaden the investigation, came to naught. Examiner Crosby ruled that issuance of such subpoenas was outside the order of the investigation.

Stirring and valiant defenses of the right of a utility to expend money to defend itself against political attack were made by Paul B. McKee, president of Pacific Power & Light Co., Kinsey M. Robinson, president of Washington Water Power Co. and Frank McLaughlin, president of Puget Sound Power & Light Co. McKee showed that expenditures by Northwestern Electric and Pacific Power & Light which might in any way be connected with opposition to public ownership had amounted to only 0.31% of gross revenues and 2.39% of net revenues in the last six years. He compared the expenditures to insurance, pointing out that the companies had paid $506,172 for all types of insurance during that period as against $184,538 for all activities against public ownership.

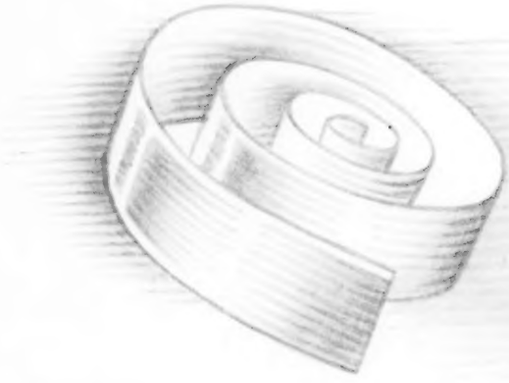
"Looking back over the last six years," McKee said, "it is something of a source of regret that we did not put up a harder battle and spend more



CHAPTER TWO

IN THE STORY OF THE G·E SPIRAKORE TRANSFORMER

SPIRAKORE — now available up to 500 kva



Again We Report Amazing Progress in Transformer Design

IN 1938, the announcement of the G-E Spirakore transformer added a thrilling chapter to the history of distribution-transformer development. The Spirakore design captured the imagination of men throughout the industry, not only because of its remarkable advantages over previous designs, but also because of the mechanical ingenuity employed in Spirakore construction. Even though its application was then limited to the 1½- and 3-kva sizes, many utility men called it the most important transformer development since the introduction of silicon core steel.

Today, in this second report on the Spirakore transformer, we are proud to announce the extension of the Spirakore design to ratings throughout the distribution range, up to and including 500 kva.

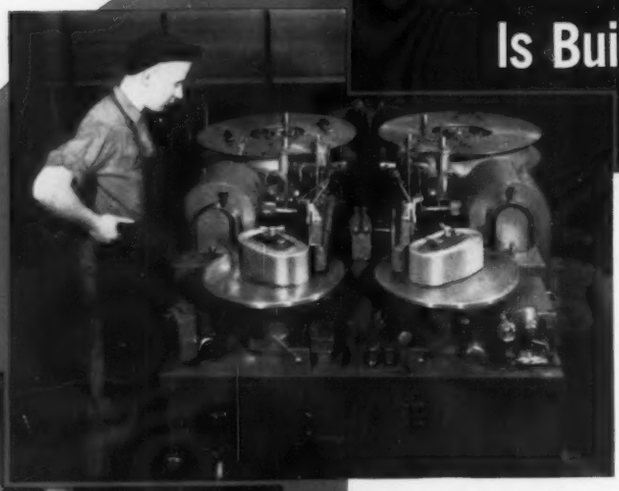
From the standpoint of the designer, the manufacturer, and the user, the Spirakore design is practically ideal. Cores formed from strips of cold-rolled steel make possible a transformer that is both superior in characteristics and more economical to manufacture.

With the introduction of the Spirakore design—in the 1½- and 3-kva units—we immediately made a price reduction of 11½ to 18 per cent. After further experience with the smaller ratings and preliminary manufacture of several larger sizes, the possibilities of this new design were so encouraging that we anticipated its application to all G-E distribution transformers and instituted a series of price adjustments. Today, the market level of distribution transformers—the complete range of ratings—averages 15 to 20 per cent lower than before the introduction of the Spirakore design.

As with the smaller sizes, the new Spirakore transformers, which are designated as Type HS, have superior mechanical and electrical characteristics. They are lighter in weight and smaller in size, for easier handling. They have better impulse characteristics, lower exciting currents and better thermal performance. All of these contribute to improved and more economical operation.

GENERAL ELECTRIC

How the SPIRAKORE Transformer Is Built in the Larger Sizes

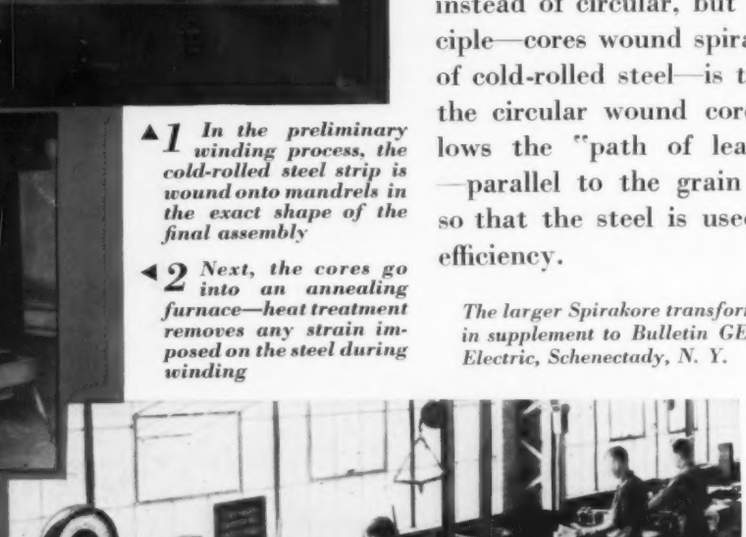


SPIRAKORE interiors in ratings 10 kva and above differ in some respects from those of the smaller sizes. The shape of the larger cores is elliptical instead of circular, but the basic principle—cores wound spirally from strips of cold-rolled steel—is the same. As in the circular wound core, the flux follows the "path of least reluctance"—parallel to the grain of the steel—so that the steel is used at maximum efficiency.

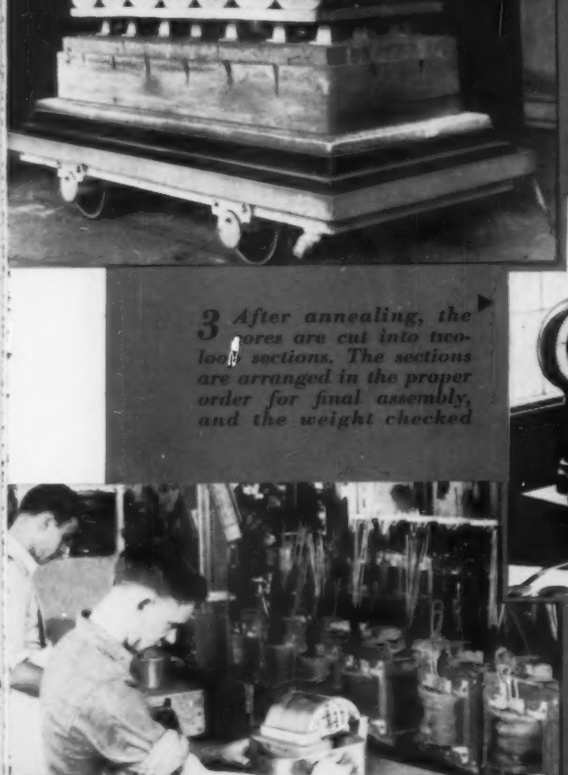
The larger Spirakore transformers are described in supplement to Bulletin GEA-2600A. General Electric, Schenectady, N. Y.

▲ *1 In the preliminary winding process, the cold-rolled steel strip is wound onto mandrels in the exact shape of the final assembly*

◀ *2 Next, the cores go into an annealing furnace—heat treatment removes any strain imposed on the steel during winding*



3 After annealing, the cores are cut into two-loop sections. The sections are arranged in the proper order for final assembly, and the weight checked ▶



▲ *4 In final assembly the core sections are placed around the coils in the proper order, so that every part of the finished core has exactly the same shape as in the annealed, preformed core*

5 The complete interior is a neat, compact, simplified assembly which makes possible small, light-weight transformers

6 The new 15-kva Spirakore transformer, for example, is appreciably smaller and lighter than the 15-kva unit of the previous design

GENERAL ELECTRIC

402-84

money getting our story to the people." Policies of the companies, he declared have been shaped to best serve the interests of customers, employees and stockholders. During the 6-year period rate reductions aggregating $1,500,000 annually have been put into effect and taxes have increased from $1,000,000 to $1,700,000.

McLaughlin submitted similar testimony for Puget Sound Power which was supplemented by statements by S. P. McFadden, executive vice-president. Expenditures on public power matters were $63,305 during the last five years, being 0.078% of the company's gross revenues and 0.689% of net. It was pointed out that the company's average domestic consumption had increased from 1,207 kw.-hr. in 1930 to 1,476 kw.-hr. in 1940 while average domestic revenue declined from $38.60 to $35.31 during the same period. Introduced into the testimony was a letter from Charles E. Carey of the Bonneville staff, to Mayor H. H. Beetle of Port Angeles, Wash., outlining plans of the Bonneville Administration to acquire the company's transmission facilities.

Puget Sound to Appeal Court's PUD Order

Puget Sound Power & Light will appeal a U. S. District Court order which recently awarded certain properties of the company to the Whatcom County PUD for $5,000,000. It will contend the District Court erred in entering a decree of public use and necessity, and also in instructing the jury which determined the value.

Meantime, negotiations by the PUD for sale of the $5,500,000 revenue bonds to finance purchase and make improvements to the properties, are in a temporary stalemate, following failure of a Chicago investment house to exercise its exclusive option to purchase. Since the formal court order was entered, interest charges against the award have reached the sum of $100,000. The formal court order provided the district must pay 6% interest on the award until a deal is consummated.

Utah Extend System For Army's Hill Field

An estimated 185,000 kw.-hr. per month will be supplied by Utah Power & Light to fill initial requirements of Hill Field, the Army's depot and air defense center located near Ogden, Utah. Near future requirements are expected to double this figure. Three and one-half miles of 44-kv. line is being run from the utility's Riverdale plant to feed directly into the Army substation. An additional tie-line will be constructed from the "Ogden B" 44-kv. line to the depot serving as a stand-by line. A mile of underground 6.6-kv. feeders will extend from the Army's 44-kv. substation to various substations about the building area. Hill Field is a $9,000,000 project covering 2,900 acres.

HOW TO CROSS THE FIFTH COLUMN

First step recommended by FBI in studying a utility or plant for protective measures is determination of danger points—locations or processes which, if damaged, could cripple all operations. Such points should be carefully mapped, and the details kept with all other confidential material in an isolated, guarded special section of the property accessible only to specified employees with legitimate business there. Records and blueprints which have only one confidential part can be drafted in two sections: One for regular use and the other, the confidential part, kept separately.

While fencing and illumination are considered the main physical protection needs, special care is recommended to finding irregular entrances such as sewers, fire escapes, etc. Gates are proposed over spur tracks, with guards posted when they are open. Parking areas should be outside the fenced area and delivery platforms should be at the fence line. Trucks and autos, where they must be admitted, must be guarded and complete records kept of their entry, purpose and departure.

Personnel control begins with obtaining complete data about each man, new as well as old employees. The FBI recommends application blanks which, in addition to usual data, call for information on citizenship, immigration status, names and addresses of relatives, military service, whereabouts and activities in 1914-18. Local home-owning residents are considered most desirable employees.

FBI recommends that the reason for all absences from work be checked, that absence without legitimate excuse be grounds for suspicion, particularly if an employee leaves town secretly. Also recommended is keeping employees in the particular part of the plant in which they work, with passes provided for necessary unusual moving about and time checks made of such trips. Strict identification through badges or their equivalent is considered essential. applicable to executives and visitors as well as regular workers.

Only thoroughly investigated men should be permitted on the guard force, which should be uniformed, carefully trained, and under command of a responsible officer. These men should change shifts at different hours from employees, and should change duties and patrols. They should have a central communication system and report at least hourly, at varying times.

A central mail room in charge of trusted employees is considered essential both for checking outgoing mail for improper material and to open incoming mail. Workmen should be barred from bringing packages into the plant unless inspected. Lunch boxes and lockers should be removed from vulnerable points of the property.

Extensive Refinancing Voted for L A Bureau

Refinancing of $13,391,000 of bonds at 2.013% interest has just been authorized by the City Council of Los Angeles for the Bureau of Water and Power. By charter amendment Nos. 1-A and 2-A at the Nov. 5 election the Water and Power Commission was permitted to revise the contract covering Hoover dam power and for the refinancing of these bonds. Lehman Bros. of New York bought the bonds. The refinancing involved an issue of $10,891,000 in revenue bonds originally issued in 1937 and carrying a higher rate of interest as well as $2,500,000 in revenue bonds to meet the cost of extending and improving the municipal electric system. Before the bonds are issued, the Bureau will set aside from its power revenue fund an amount sufficient to redeem another $2,500,000 of outstanding bonds issued in 1938.

Antagonism between the Council and the Water and Power Commission flared up again when the commission proposed to employ Ford, Bacon and Davis, New York engineers, to make a survey for the projected $8,000,000 steam plant.

● NAVY YARD CAPACITY at Bremerton, Wash., will be doubled with the laying of 4 mi. of new cable from Richmond Beach to President Point by Puget Sound Power & Light. Cable, substation and transmission line make up a project to cost $340,000.

YULE LIGHTING in Salt Lake City succeeded primarily through the efforts of these men: (L to R) L. B. Flint (Flint Co.), chairman of the Utah Electric League's Xmas lighting committee; J. L. Fahey (G-E Supply), director of the Junior C of C National Xmas lighting program; E. J. Strong, manager of Electric League of Utah

● RAYONIER PULP PLANT, Hoquiam, Wash., will spend $75,000 to construct a new building and install a 2,000-kw. turbine, Manager S. Lucey reports.

● A 20% INCREASE in the amount of power consumed since the beginning of 1940 has resulted in the installation of a new steam turbine and added facilities at the Municipal Power & Light Co. of Murray, Utah. The plant has nearly doubled its output since January 1939.

● SIERRA PACIFIC POWER has been authorized by FPC to issue and sell $3,000,000 principal amount of its first mortgage bonds, series A, 3¼%, to be dated as of Dec. 1, 1940, and to be due Dec. 1, 1970.

● MODERN BOOKKEEPING will soon be available to Seattle City Light. The city council has granted superintendent E. R. Hoffman permission to spend $54,000 to install a modern system, replacing one in use for 25 years.

● THE COMMUNITY CHEST OF SPOKANE will be enriched by $14,400 donated by Spokane employees of Washington Water Power and of Spokane United Rwy., according to W. H. Ude, head of the company's claim, tax and right of way department, who is in charge of the campaign for the two companies. The amount exceeds by $700 that contributed last year.

REA News—

Four rural electrification administration co-operatives in the State of Washington and one in Oregon signed contracts recently for the purchase of power from the Bonneville and Grand Coulee dams.

Largest of the contracts was signed by officers of the Inland Empire Rural Electrification, Inc., which operates a 1,500-mi. system in Stevens, Spokane, Whitman, and Garfield counties in the northeastern corner of Washington. This REA contracted for an initial 800 kw. of Bonneville-Grand Coulee capacity. Other co-operatives which executed contracts were the Columbia County (Wash.) Rural Electric Assn., 300 kw.; the project sponsored by Kittitas (Wash.) Public Utility District No. 2, 100 kw.; the Wasco (Ore.) Electric Co-operative, Inc., 200 kw.; and a co-operative sponsored by Public Utility District No. 1, Lewis County (Wash.), 400 kw. All contracts cover a 20 year period.

● WESTERN COLORADO POWER CO. has been chosen to energize 111 mi. of power lines of the San Miguel Power Assn., Inc., an REA project in eastern Colorado. The line will extend from Ilium to the towns in the southwest portion of Montrose county including Norwood, Nucla, Uravan and others.

LOWER VALLEY POWER & LIGHT, INC., of Wyoming, was allotted $18,000 to build 23 mi. of line.

EMPIRE ELECTRIC ASSN., INC., Dove Creek, Colo., was allotted $17,000 for the installation of a mobile diesel generator.

LANE COUNTY ELECTRIC COOPERATIVE, INC., Eugene, Ore., has been allotted $595,000 to build and acquire 352 mi. of line to serve 1,311 members in Lane County.

NORTH DOUGLAS ELECTRIC COOPERATIVE, INC., Rosenberg, Ore., will construct 43 mi. of 33 kv. transmission line on an allotment of $125,000 which it has received.

TO THE PRAIRIE POWER COOPERATIVE, INC., of Idaho, $87,000 to build 115 mi. of line.

TO THE GARKANE POWER ASSN., INC., of Hatch, Utah, $22,000 for additional generating equipment.

SMOOTH LAKE ELECTRIC ASSN., INC., a Utah cooperative, has asked the FPC for authority to build a hydro project on the East fork of the Lake Fork River. The project is under construction, is estimated to cost $185,641, will embody three 300-kw. units, and is to be financed through an REA loan.

RECENT ALLOTMENTS FOR RE-LENDING to finance house wiring and plumbing installations include: Gunniason County Electric Association, Inc., Gunniason, Colo., $3,000; Yampa Valley Electric Association, Inc., Steamboat Springs, Colo., $5,000; Prairie Power Cooperative, Inc., Fairfield, Ida., $3,000; Holy Cross Electric Association, Inc., Eagle, Colo., $4,000; Malheur Cooperative Electric Association, Vale, Ore., $10,000; Northwest Clackamas County Electric Cooperative, Inc., Sandy, Ore., $5,000; Garkane Power Association, Inc., Hatch, Utah, $5,000.

ELECTRIQUIZ ANSWERS

1. True.
2. False. On a series street-light circuit, the opposite is true, the amperage remaining constant and the voltage varying with the number of lamps.
3. True.
4. False. He is director of the G-E lighting research laboratory at Nela Park.
5. True. One customer near Bishop resides above the 11,000 foot point, and distribution near Niland is approximately 175 feet below sea level.
6. True.
7. True.
8. False. The initials NEMA stand for the National Electrical Manufacturers Association.
9. False. These inspirational words were voiced by Thomas A. Edison.

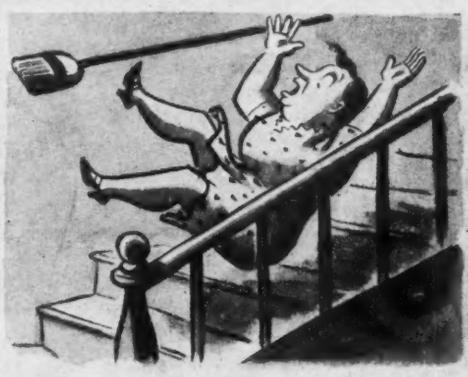
WHO AM I?

Answer to "Who Am I? on page 46: D. E. Harris.

Collier's

How to get yourself talked about ...sprain your wife's ankle ...strain your kid's eyes ...AND SAVE 15¢

1 It's amazing how unpopular you can become through one simple act of bulbsnatching. You start by taking a 25 watt bulb out of the hall and putting it in your reading lamp...



2 The immediate result is you leave the hall in darkness. This has great possibilities, as shown in the sketch above...

3 Next—your small boy tries to study by the light of the snatched bulb and lays the groundwork for a fine case of eyestrain. And all you've saved is the 15¢ a new 100 watt G-E MAZDA lamp would have cost in the first place.

Made to stay brighter longer
75 and 100 watt... 15¢
15 and 25 watt... 10¢
40, 50, and 60 watt... 13¢
100-200-300 watt... 60¢
G-E MAZDA LAMPS
GENERAL ELECTRIC

4 To avoid all this, simply buy some *spare* G-E MAZDA lamp bulbs. Get *enough* so every reading lamp can total at least 100 watts. They cost less and give more light than ever before! Get some today! Don't be a bulbsnatcher!

SPEAKING OF GETTING TALKED ABOUT, "Bulbsnatching" is fast becoming a household word in your territory—thanks to ads like this running in the Post, Collier's, Liberty, Look, and other national magazines. This kind of copy fills empty sockets because it gets read *all the way through.* General Electric Co., Nela Park, Cleveland, O.

Bonneville Progress New Line Ordered

Bonneville-Grand Coulee Administrator, Paul J. Raver, last month ordered construction of a 50-mi. steel tower transmission line from Bonneville dam to Oregon City, Ore. In signing the order Raver said the line, when constructed, will provide additional capacity for Willamette Valley communities. It will complete a loop in the delivery of Bonneville power to the Portland area. Portland is now served by way of the 36-mi. Bonneville-Vancouver line. This carries power to the administration's substation just north of Vancouver and thence across the Columbia into the St. John's district.

Mining Survey Undertaken

The Bonneville-Grand Coulee Power Administration is proceeding immediately with a survey of mining operations in the northeastern part of Washington with the view of assisting their development through the use of Columbia River power.

Administer Raver said H. L. Gage, mining engineer of the Market Development Section of the Power Administration would arrange for meetings in the Spokane-Grand Coulee area with miners and mining organizations, for the purpose of ascertaining preliminary procedure which will be applicable as well for other mining territories in the Pacific Northwest.

● A PROJECT to carry the Bonneville power line right-of-way clearing from Renton, near Seattle, to the Columbia River near Rock Island and in Chelan County, has been approved by the Washington State WPA office and forwarded to Washington, D. C., for final approval. Distance totals approximately 117 miles, involving in excess of 3,000 acres of clearing, 65 percent of which would be done in heavy timber. The work would require $1,395,965 from WPA and $408,708 from the Bonneville project.

● LOW BIDDER on more than 800 steel towers and appurtenances for the 185-mi. Bonneville line between Grand Coulee Dam and Covington, Wash.: The American Bridge Co. of Pittsburgh, Pa., at $713,950.

● BONNEVILLE ADMINISTRATION has announced a low bid on 25,000 kva. of transformers, complete with accessories, for a substation at Covington, Wash., enroute to Seattle and Tacoma. The low bidder: G-E, at $520,028.

TRADE *notes*

WESTINGHOUSE MOVES SEATTLE OFFICE

Westinghouse last month consolidated all Seattle area activities of its engineering, sales and treasury departments of the manufacturing company, and the Westinghouse Lamp Div., in the Westinghouse building at 3451 East Marginal Way. On Dec. 20, those departments and personnel which had offices in the Lloyd Bldg. moved to the larger quarters formerly occupied only by the accounting and service departments, the service shop, warehouse and the Westinghouse X-ray Company.

Seattle headquarters and warehouse facilities of the supply company and of the merchandising division of the manufacturing company remain unchanged at 1051 First Ave., S. K. L. Howe, Seattle sales manager for the company, said he expected the consolidation will improve efficiency and facilitate work in relation to the national defense program.

● B. H. CHAMBERLIN, formerly of the Cutler-Hammer Detroit office is now with the Company's Los Angeles sales

CHAMBERLIN

staff, according to W. G. Tapping, manager of the Los Angeles District territory.

● FLINT DISTRIBUTING CO., Salt Lake City, has celebrated its sixth anniversary as an electrical wholesaler. Organized December 4, 1934, by Leland B. Flint and three associates, the company has grown to be recognized as one of the outstanding electrical wholesalers in the intermountain territory occupying modern offices and vast warehouse and employing a personnel of 31.

● GIBSON ELECTRIC REFRIGERATOR CO. held its western regional meeting at San Francisco early in December, some months ahead of the usual refrigerator showings by manufacturers. In charge of the western show was Les Taufenbach, western division sales manager, Frank S. Gibson, Jr., treasurer of the company, Harry Lippert, special range representative for the western division, and Jerry Klintworth, Gibson Service Department. Seven models are offered in a new 1941 Gibson line, two with dropped down freezing units and five with the Gibson freezer shelf.

The standard models list at the factory at $89.95 and $109.95; those with the freezer shelf $129.95 and up to $219.95. The ranges of the Gibson line include four models for 1941 beginning at $99.95 up to $229.95. A special feature of the top model is temperature control on the cooker well, permitting operation like a small electric oven.

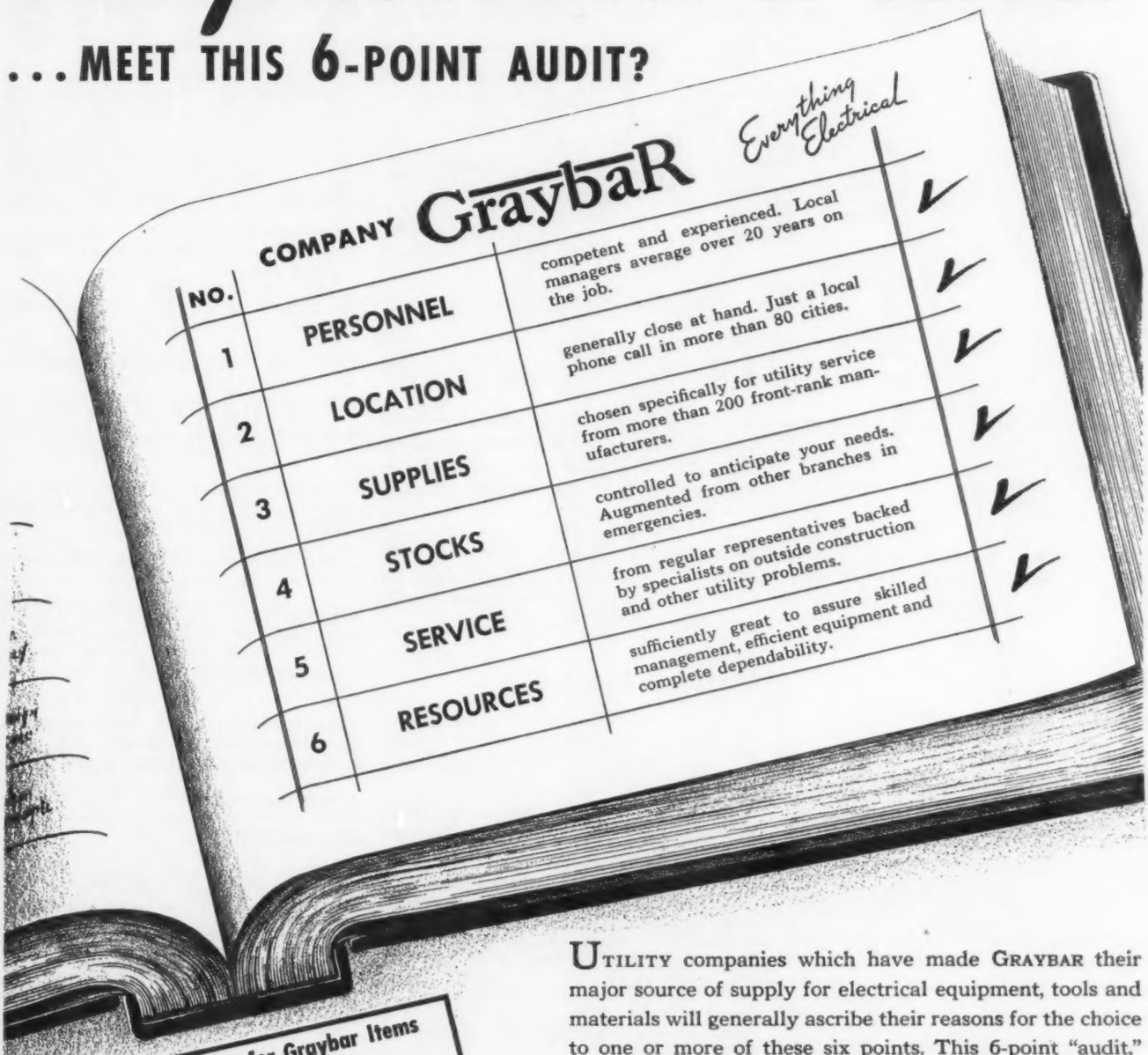
HOCKENSMITH FIRM FORMED

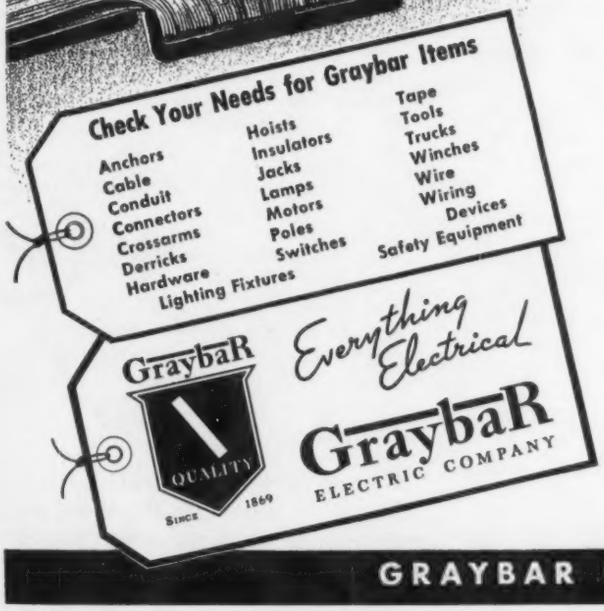
Hockensmith Sales has been opened by F. L. Hockensmith and his son at 443 South San Pedro St., Los Angeles. Hockensmith Sales will handle manufacturers' lines particularly in the industrial electrical field. First to be announced is that of Superior carbon brushes manufactured by Superior Carbon Products, Inc.

● NEW OFFICERS of the Retail Development League, No. 60, General Electric Supply's dealer organization in the Salt Lake City area were elected recently. H. W. McCune, manager of Bailey, McCune & Riteway, Nephi, Utah was chosen president. Roy Shaw, manager of the Electric Service Co., Brigham City, was elected vice-president and W. E. White, manager of the appliance department, Geo. A. Lowe's Co., Ogden, secretary.

● W. E. DARDEN, with display and office on the 4th floor of Western Merchandise Mart, San Francisco, has been appointed northern California representative of the Deepfreeze household frosted foods locker boxes manufactured by Motor Products Corp., Detroit. This new type of refrigeration unit is a below-zero storage locker box for frosted foods and indefinite preservation of fish and game.

CAN *Your* SOURCE OF SUPPLY ...MEET THIS 6-POINT AUDIT?


COMPANY GraybaR
Everything Electrical
NO.
1 PERSONNEL competent and experienced. Local managers average over 20 years on the job.
2 LOCATION generally close at hand. Just a local phone call in more than 80 cities.
3 SUPPLIES chosen specifically for utility service from more than 200 front-rank manufacturers.
4 STOCKS controlled to anticipate your needs. Augmented from other branches in emergencies.
5 SERVICE from regular representatives backed by specialists on outside construction and other utility problems.
6 RESOURCES sufficiently great to assure skilled management, efficient equipment and complete dependability.



UTILITY companies which have made GRAYBAR their major source of supply for electrical equipment, tools and materials will generally ascribe their reasons for the choice to one or more of these six points. This 6-point "audit," they say, provides a sound basis for passing judgment on any distributing organization.

With the beginning of the new year, we suggest that you audit your own sources of supply for electrical items... particularly outside construction items... on this six-point check-list. We believe you'll find, as so many others have, that GRAYBAR'S national distribution network has certain inherent advantages... acquired in over 70 years of growth ...that swing the balance in its favor many more times than not.

A 24-page booklet "GRAYBAR at a Glance" will give you a clearer concept of why this is so. Write for a copy. Graybar Electric Company, Graybar Building, New York.

GRAYBAR IN OVER 80 PRINCIPAL CITIES

PRECISION CHEFS was the order to which these Universal range specialists were admitted Dec. 16, at Landers, Frary & Clark convention in New Britain, Conn. Demonstrating the technique are: (L to R) V. J. Girardin, Dallas (and Ariz.); A. A. Kuhnhausen, San Francisco; A. P. MacIlroy, Minneapolis; Harry Kuhnhausen, Seattle.

● DINWOODEY FURNITURE CO., Salt Lake City, one of Utah's pioneer business establishments, recently installed an up-to-date appliance department handling a complete line of Westinghouse merchandise. James R. Woodward is supervisor.

● BURT DORRIS has been appointed sales representative contacting west coast distributors, according to Fred N. Anibal, radio sales manager of Stromberg-Carlson Telephone Mfg. Co. Dorris formerly managed the radio department of Electrical Supplies Distributing Co., this firm being Stromberg-Carlson's distributor in San Diego. His headquarters will be in the Western Merchandise Mart, San Francisco.

● THE WHITE SEWING MACHINE CO., of Cleveland, Ohio, moved its Pacific Coast headquarters offices and showroom into the Western Merchandise Mart, San Francisco, in December. F. Stringer, western division manager, makes his headquarters there.

● NEW UTAH POWER & LIGHT CO. offices at American Fork were formally opened recently. R. E. Bailey is division manager and W. L. Faddis, sales manager. According to company officials, these offices conclude changes the company will make in its southern division.

● KEN M. ANDERSON has opened up an office as manufacturers' representative at 1807 Olympic Blvd., Los Angeles. Formerly representative for Appleton and prior to that of Steel and Tubes, Anderson will handle curving materials lines.

● OLIVETOS ASSOCIATED, hardware store of Price, Utah, has established a modern electrical appliance department with Jack Houston as manager.

Contracts Awarded

TO THE YAKIMA ELECTRIC CO. of Wash., $60,239.90 to build 82.5 mi. of line for the Benton Rural Electric Association of Wash., an REA project.

TO ELECTRIC SMITH of Spokane, $37,218.22 to build 44.8 mi. of line for the Nentelem Electric Cooperative, Inc., of Wash., an REA project.

TO THE SANDBERG AND JOHNSTON CONSTRUCTION CO., Hampton, Iowa, $33,354.46 for building 21.5 mi. of lines for the Southeast Colorado Power Association, an REA project.

TO HEGEN AND MCCLINTIC, Rigby, Ida., $78,389.62 to build 104 mi. of line for the San Isabel Electric Association of Colorado, an REA project.

TO A. R. ALLISON, Grand Junction, Colo., $88,224.64 to build 117 mi. of line for the Holy Cross Electric Association, Inc., of Colorado, an REA project.

TO THE BROOME ELECTRIC CONSTRUCTION CO. of Amarillo, Texas, $31,835.18 to build 16 mi. of line for the Farmers' Electric Cooperative of New Mexico, an REA project.

TO HOMER G. JOHNSON, of Portland, Ore., $25,999.60 to build 25 mi. of line for the Benton Lincoln Electric Cooperative, Inc., of Oregon, an REA project.

TO HOMER G. JOHNSON of Portland, Ore., $117,360.85 to build 237 mi. of line for the Central Electric Cooperative, Inc., of Oregon, an REA project.

TO THE I AND E CONSTRUCTION CO., Inc., of Minneapolis, $148,821.74 to build 186 mi. of line for the North Douglas Electric Cooperative of Oregon, an REA project.

TO NE PAGE ELECTRICAL CO., Seattle, a $56,120 street lighting system at McChord Field near Tacoma.

TO City Electric & Fixture Co., 1022 Third Ave., Seattle, on a bid of $3,990, for installing a doctor's paging system in the Marine hospital in Seattle.

TO THE WASHINGTON ASPHALT CO., Seattle, for constructing a substation at Mossy Rock, Wash. for the Lewis County PUD, $18,906.

Moved

BENNETT AND TAYLOR, electrical contractors, from 598 San Fernando Rd., to 111 West 7th St., Los Angeles.

ADAMS ELECTRIC CO., from 363 Maple St., to 3548—19th St., San Francisco.

STATE ELECTRIC CO., from 433 Locust St., to 2027 San Jose Ave., San Francisco.

GENERAL ELECTRIC FIXIT SHOP, from 1531 East Broadway, Long Beach, to 534 East 10th St.

DALE BUMSTEAD, JR., formerly with P. C. Moore & Co., Seattle, to Bumstead-Woolford Co., 1411—9th Ave., Seattle.

KING ELECTRIC CO., Ellensburg, Wash., to 414 North Pine St.

WESTERN SUPPLY CO., Salt Lake City, electrical jobbers and distributors of Crosley and Universal appliances, offices and warehouse from 140 Pierpont Ave. to 357 West 2nd South St.

J. G. POMEROY CO. to a new home with better equipment at 1004 East Fourth St., Los Angeles, where the telephone is now MA-1105.

UNION ELECTRIC CO. of East Bremerton, Wash., to a new home built for its use at 925 Winfield Ave.

STANDARD SALES CO. to new headquarters at 1219 West First Ave., Spokane, Wash. Standard Sales is distributor for Crosley.

TO THE WESTINGHOUSE BUILDING at 3451 East Marginal Way, Seattle, those departments and offices formerly in the Lloyd Bldg. Supply company and merchandising division operations continue at 1051 First Ave. S.

SPOTT ELECTRIC CO., a pioneer electrical contracting firm in Oakland, moved from 569 19th St. to 576 22nd St.

FROSTILAIRE UNITED CO. moved from 7505 Foothill Blvd. to 7629 Foothill Blvd., Oakland.

MARIN ELECTRIC SHOP of Dinuba, Calif., moved to 229 East Tulare St.

● SMALLCOMB ELECTRIC CO., ventilation specialists and motor shop of Los Angeles, moved Dec. 1 to a much larger shop and display room at 1120 South Main St. from 507 East 7th St., Clare Smallcomb announced.

● CAYGILL CO., representative for the Blackstone washer in the West, moved into larger offices and showroom space on the floor of Western Merchandise Mart, San Francisco.

These New 1941 General Electric Ranges Will Sell on Sight!

And the New G-E "Roast of the Month" Club Will Bring Customers into Your Store!

Tie These New 1941 Ranges to the Greatest Range Promotion Idea Ever Offered to Dealers!

Here's promotion that really will pull prospects into your store. It will make them *look* at G-E Ranges. It will lead them to *buy* G-E Ranges from you.

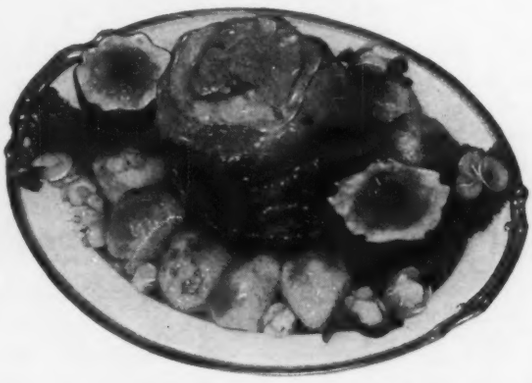
Heavy G-E advertising will draw armies of women into the G-E "Roast of the Month" Club. Every one of these women must come to a G-E dealer to enroll. Every roast she puts into her oven will put a G-E Range in her mind.

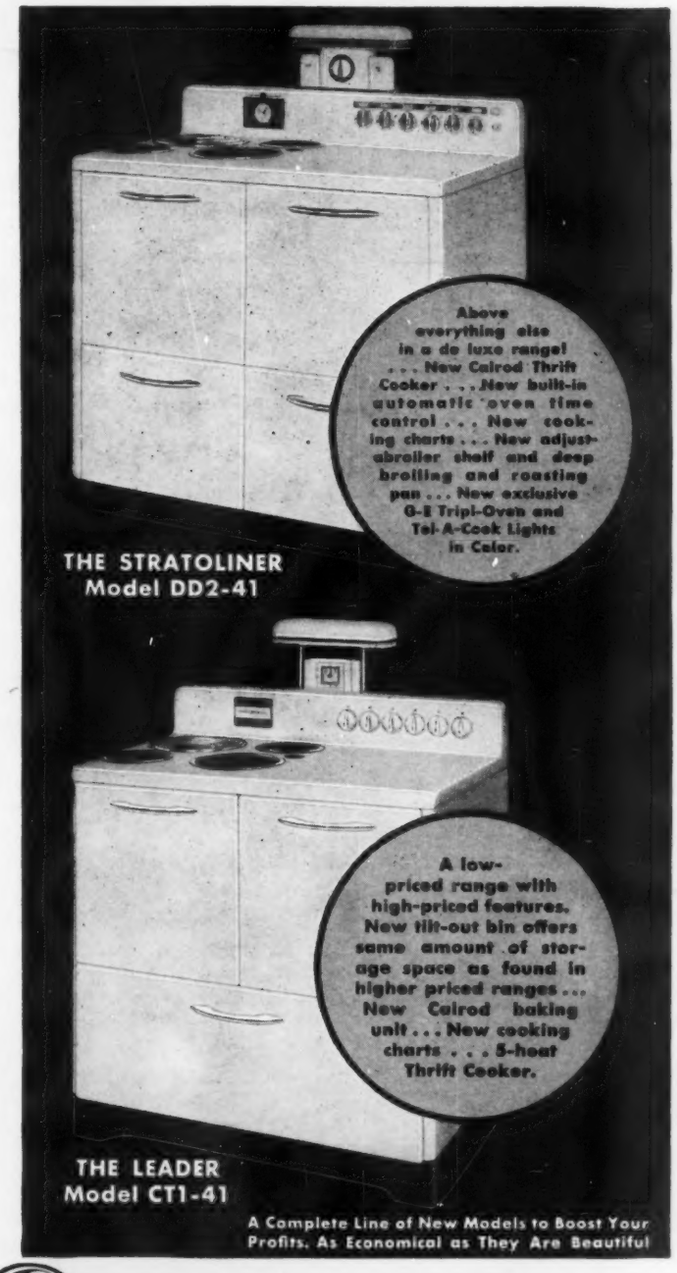
Here's promotion that *does* something for you at the point of sale. Permits you to tell to willing, friendly ears the new G-E story of feature after feature for clean, fast, thrifty cooking—electrically—on a G-E Range.

The G-E Range promotion for 1941 will keep close step with the G-E "Roast of the Month" campaign. Color ads in magazines. Powerful mailing pieces. Handsome store displays. Punchy newspaper ads to build your business locally.

Coming soon! A beautiful folder with complete details on the G-E "Roast of the Month" Club and how dealers can cash in on this tremendous nation-wide program. Keep in touch with your G-E distributor!

Every Roast Will Work for You in 1941!




Above everything else in a de luxe range! . . . New Calrod Thrift Cooker . . . New built-in automatic oven time control . . . New cooking charts . . . New adjustabroiler shelf and deep broiling and roasting pan . . . New exclusive G-E Tripl-Oven and Tel-A-Cook Lights in Color.
THE STRATOLINER
Model DD2-41
A low-priced range with high-priced features. New tilt-out bin offers same amount of storage space as found in higher priced ranges . . . New Calrod baking unit . . . New cooking charts . . . 5-heat Thrift Cooker.
THE LEADER
Model CT1-41
A Complete Line of New Models to Boost Your Profits. As Economical as They Are Beautiful

GENERAL ELECTRIC

PEOPLE
made this news

Ross Heads P G and E Personnel Staff

Raised to the post of personnel manager for Pacific Gas and Electric is Harry C. Ross, long-time employee of the company, who for the past six years has been manager of the claims and

ROSS

safety division. He fills the post left vacant Nov. 1, by the death of E. G. McCann.

Ross joined PG and E in 1915, after working for utilities in Baltimore and Pittsburgh and for Southern California Gas. His first job with PG and E was at Fresno, and he was manager of the Fresno district for several years prior to his transfer to San Francisco in 1930.

Bertrom K. Dunshee moves to Ross' position in claims and safety. He joined the company in 1922, has been assistant engineer in the land department.

Jewell Takes Over for Wesco at San Francisco

From Richmond, Va., across the continent to San Francisco, Calif., has come W. "Bill" M. Jewell to become manager of the San Francisco division of Westinghouse Supply Co. This division comprises the three Westinghouse Supply houses at San Francisco, Oakland and Sacramento. In Richmond, Va., Jewell likewise had charge of three houses with headquarters at Richmond, two of which he opened himself during his managership of the Virginia division of the middle Atlantic district.

With Westinghouse Supply since 1925, Jewell was at first employed at the Washington, D. C., house and in 1932 sent to Richmond. Prior to 1925, for nine years, he was connected with National Electric Supply Co., in Washington, D. C.

Award to Bureau Man for Pole-Top Rescue

Laverne J. Ryan, Los Angeles Bureau of Power & Light lineman, now wears the National Safety Council's president's medal for the successful pole-top resuscitation of a fellow worker who had come in contact with a 4,800-volt line. The presentation was made Dec. 12 with Ernest Dutcher, president of the Southern California Industrial Safety Society, representing the national organization. Ryan's rescue was said to have been the first application of the pole-top method in the West.

Promotion for Fryer In New York Job

News of still further promotion of Leonard Fryer formerly sales manager, Graybar Electric Co., San Francisco, who recently went to New York, has come in the announcement that he has been made secretary to the general sales committee of Graybar in New York.

● R. E. ZIMMERMAN, vice president of the U. S. Steel Corp., is the new president of the American Standards Association, succeeding Edmund A. Prentis.

● JAMES METCALF, consulting power economist of Seattle and former chief of the System Planning and Marketing Division of the Bonneville Administration, has been named temporary manager of the Longview system—Washington Gas and Electric property being taken over by Cowlitz County PUD No. 1. His assistant will be Harry Kelsey, formerly of the Gray's Harbor PUD at Aberdeen, Wash.

● STEVE WINTER has become affiliated with Westinghouse Supply Co. in the San Francisco Bay region. Winter was with the G-E display at the San Francisco Exposition during the past two years and previous to that a sun lamp specialist.

● T. C. (TOM) CLARKE, British Columbia district manager Northern Electric Co., Ltd., returning to his office at Vancouver after an illness of several months was tendered a reception by associates. Arthur L. Brown, assistant general sales manager Northern Electric Co., Montreal, who has been in charge of the Vancouver branch in Mr. Clarke's absence for the past three months, has now returned East to resume his former duties.

● FRED J. HUME, president of Hume & Rumble Ltd. of Vancouver, New Westminster and Edmonton, largest electrical contracting firm in Western Canada, has been re-elected for a further term as mayor of New Westminster, B. C. His re-election establishes a record for length of service as mayor in the 70 years' civic history. Mayor Hume will start his ninth year, longer than any other mayor has ever held the office. He was first elected to the city council as an alderman in 1922.

● JOHN S. BAILY, formerly with the Hood River, Ore., office of the Pacific P & L, has been named manager in Goldendale, Wash. Baily succeeds John Nath, who resigned to enter the army at Fort Lewis.

● TOM MCDONOUGH recently was appointed Arizona representative for IES. He appears below beside a Swallow biplane. In the early 30's McDonough was representative for an electrical

McDONOUGH

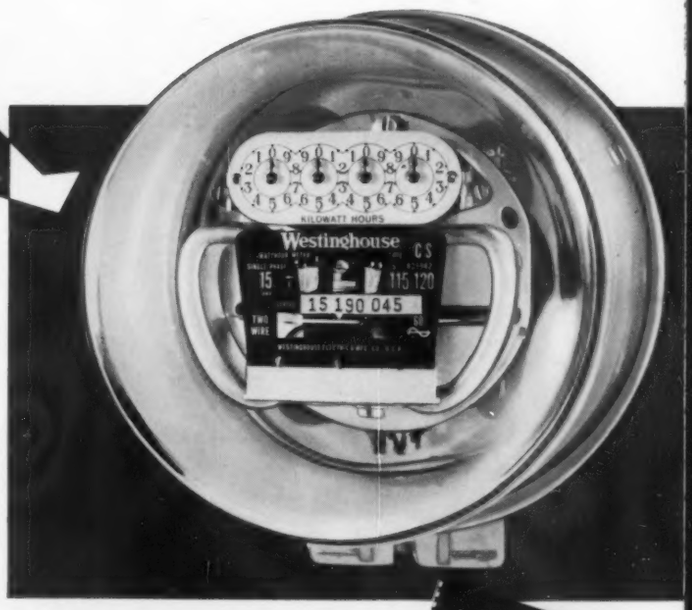
manufacturer and at that time used his plane on some of his longer business trips. He continues its use, he says, mainly for his own amazement. He is illuminating engineer for Central Arizona Light & Power—offices in Phoenix.

no recalibration

WHEN PERMANENT MAGNET IS REMOVED

REMOVE—REPLACE—as many times as you wish! The permanent magnet goes back in correct position . . . every time! Take-down tests on Long Time Meters prove that recalibration after reassembly is unnecessary! *Full load adjustment* is built in and is not disturbed when magnet is removed.

MOUNTING SURFACES MACHINED to close tolerances provide accurate positioning when tightened. Parts can be assembled in only *one* way—the right way.



LONG TIME METER VALUE is something you don't have to take for granted. You can see the reasons with your own eyes—corrosion-proof gold finish on register and gears—milled involute gear teeth—ball and jewel bearings on disc shaft . . . and a unit-built damping magnet that stays put no matter how many times you remove and replace it.

RIGID UNIT CONSTRUCTION eliminates displacement of separate parts of the magnet assembly. Full load adjuster is integral and requires no resetting when the assembly is removed.

PRECISION FRAME on which magnet is mounted is one piece of *drawn* steel—no internal stresses alter its shape. Permanent alignment is assured by extra thickness of metal and its self-bracing design. Close tolerances of dimensions within .001 to .003 inch are maintained during manufacture by micrometer and gauge checks!

The booklet "Key To Long Time Meter Value" tells why recalibration is unnecessary after you dismantle and reassemble the LONG TIME Meter. Write for B-2247, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

J-40293

Westinghouse Meters

PORTLAND GOES R.I.P.*

Portland General Electric Eliminates Radio Interference on New 57.1 Kv. Line

Straight through the heart of busy Portland, Oregon, runs a new 57.1 Kv. line of the Portland General Electric Company. No porcelain insulator along its 14 mile length will disturb the favorite radio programs of thousands of neighboring set owners. Line construction with Westinghouse R.I.P. (radio-interference-proof) porcelain insulators guarantees it will be free of insulator-generated noises. The use of Westinghouse R.I.P. porcelain insulators is an important mark of up-to-date line engineering . . . and equally important . . . indicates a foresighted good will policy toward Portland General Electric customers.

R.I.P.* PORCELAIN

R.I.P.* (radio-interference-proof) porcelain has a special metallic oxide glaze, developed by Westinghouse, which becomes an integral part of the insulator during normal firing. Westinghouse guarantees this process to eliminate distressing radio interference at the insulator.

Specify R.I.P. porcelain, as permanent and economical protection against radio interference at the insulator, on replacements and new lines. For complete details write Westinghouse Electric & Manufacturing Co. Two plants—Derry, Pa., and Emeryville, Calif.,—will supply your needs.

J-05113

Westinghouse Porcelain

W WESTINGHOUSE ELECTRIC

G-E Promotes Three Westerners

The new year finds three Western G-E men with important new positions, most important of which is the post of Pacific District engineer, held by Walter C. Smith. There has been no district engineer since G-E established its Pacific District three years ago. Smith has been engineer in the San Francisco office since 1932.

SMITH

Others with promotions are: O. A. Gustafson, from central station engineer at Los Angeles, to Pacific District central station engineer, and R. O. Brosemer, from engineer in the San Francisco office to Pacific District industrial engineer.

Walter Smith is well known to many participants in PCEA and AIEE engineering discussions as one of those rare individuals who can state complicated engineering concepts in simple terms. He also has more tangible distinctions, such as Fellowship in the AIEE (he is a past-chairman of the San Francisco Section), the Coffin award for designing an auto transformer, membership in the Astronomical Society of the Pacific, as well as several electrical groups.

He has been with G-E since he graduated from Michigan in 1905. His association with the West dates from 1920, when he went to the San Francisco office as transformer specialist.

Gustafson is a University of Idaho graduate, class of '23. He was doing design engineering at Schenectady for G-E, until he moved to the Los Angeles office in 1928.

Bob Brosemer, another past chairman of San Francisco's AIEE Section, joined G-E after graduation from the University of California in 1925. He was assigned to the San Francisco office in 1929.

● W. S. McCrea, engineer, Tacoma, Wash., will supervise construction of new lines and services for Skamania County PUD No. 1.

● Herbert L. McDonald has now joined the publicity department of the British Columbia Electric Railway Co. He is acting as managing editor of the B. C. Electric Employees Magazine and participating in editorial work in connection with the department as well as in some spheres of company advertising.

● Harry P. Earl, credit manager of Utah Power & Light Co., has been appointed secretary-manager of the Associated Retail Credit Men.

BROSEMER

● George C. Miller of Vancouver, for many years one of the heads of the Jarvis Electric Co. at Vancouver, and still connected with the electrical industry, has been elected unanimously as president of the Union of British Columbia Municipalities.

● Arthur Kempston, former field man for the Electrical Development League of Southern California specializing on uniform code and ordinance work, has joined the staff of the Pacific Coast Electrical Assn. as field representative. He will continue his code and ordinance activities in the territory served by the Southern California Edison Co.

● E. G. Kiffer, supt. of the Surprise Valley Electrification Corp., Modoc County, Calif., has resigned to accept a civil service commission with the REA in Washington, D. C. Jesse M. Grigsby of Modesto, Calif., has been selected by the board of directors to succeed Kiffer.

● Henry Livran, for 14 years commercial, government and municipal salesman for the Western Colorado Power Co. at Montrose, Colo., is now affiliated with the Lockheed Aircraft Corp. at Burbank.

● R. M. Grek was recently appointed general manager of the Ritzville Trading Co., Ritzville, Washington.

● Lloyd E. Larsen, recently field coordinator for the Light Conditioning program in the Northwest operating under the Light Conditioning Sales Service of New York, took over the Chicago area for this activity on Jan. 1. Larsen was formerly connected with the illuminating engineering department of Portland General Electric, later becoming resident engineer in Portland for Silvray Lighting, Inc. During the past year with Light Conditioning Sales Service, he has also represented Vision-Aids, Inc., in the Northwest. Larsen will make his headquarters at Graybar Electric.

GUSTAFSON

● F. L. Hockensmith has been appointed representative in southern California and Arizona for portable and stationary electro-plating outfits manufactured by W. A. Hesse & Co. His offices: 443 S. San Pedro, Los Angeles.

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
MOUNT VERNON, N. Y.

Representatives:
A. R. Slimmon, 445 E. 3rd St., Los Angeles
Geo. H. Curtiss, 540 McAllister St., S. F.
H. M. Sayers, 1019 Eastlake Ave., Seattle
Stevens Sales Co., 41 P. O. Place, Salt Lake City

GEO. E. HONN CO.
420 Market St. San Francisco, Calif.

Manufacturers' Representative for

PYREX INSULATORS
S & C PROTECTIVE DEVICES
CORNELL-DUBILIER CAPACITORS
KELLEMS CABLE GRIPS
BLACKBURN CONNECTORS
COLUMBIA TONG TEST AMMETERS —LOW VOLTAGE GENERATORS
BARTLETT TREE TRIMMING EQUIPMENT
METER JEWELS
BIERCE CONE ANCHORS —GUY WIRE GUARDS

G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks
Send for Catalogue
We have been making safety tools for 24 years
THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

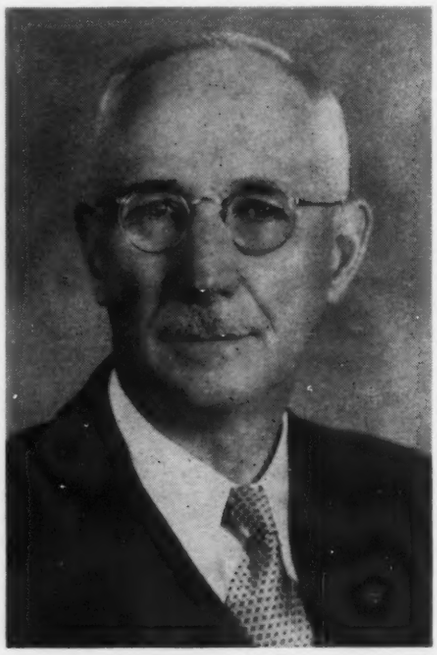
ELECTRICAL TESTING LABORATORIES
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.
2 East End Ave. New York

FIRST CALL TO ARMS

Army, Navy draw officers from industry's ranks

Military 1941 finds many electrical men in uniform. And as more conscripts are called, more officers will be needed, and more inroads will be made on the industry's ranks.

Greatest military distinction to men associated with electrical industry came



GEN. WINDSOR

last month with the promotion of Brig. Gen. Harrison G. Windsor, personnel director of Puget Sound P & L, to the rank of Major General on the retired list. General Windsor, a member of the National Guard of Washington State, reached retirement age in 1932. His appointment marks the first time in the history of the Washington National Guard that any man, either in active service or retired, has attained the rank of Major General.

More disturbing to the individuals concerned were the calls to active duty. The ways of civilian life were put aside —theoretically for a year, but many expected to remain for the duration. Among reserve officers on duty at year's end were:

Cal-Ore Power

ZUMR, CHARLES F., merchandise service man — 2nd Lieut., Oregon National Guard, Camp Clatsup, Oregon, Battery C.

Idaho Power

ROWELL, LYLE M., chief draftsman—Major, Engineers, Fort Lewis, Wash.

BOGGS, CLARENCE E., designer—Lt. Col., Artillery, Fort Lewis, Wash.

BLAIR, AL G., computer (eng. dept.)—1st Lieut., Infantry, Fort Sam Houston, Texas.

BYRNE, M. E., electrician—1st Lieut., Infantry, Hamilton Field, Calif.

Mountain States Power

REETZ, NORVAL G., Kalispell division superintendent—1st Lieut., Field Artillery, Fort McArthur, Calif.

Nev-Cal Electric

FIELD, EUGENE H., record clerk, Distribution Dept.—2nd Lieut., 63rd Coast Artillery, Fort Bliss, El Paso, Texas. He is married and has two children.

LINDSLEY, CHESTER M., radio engineer—Lieut., Jr. Grade, U. S. Naval Res., Fairfax Flying Field, Kansas City, Kansas.

PG and E

BENOIST, T. M., assistant load dispatcher—2nd Lieut., Signal Corps, Fort Ord, Calif.

BURK, FREAR, assistant engineer.

GRAFF, U. B., senior draftsman, electrical mechanic — Reserve Officer, Fort Scott.

HANSEN, H. W., engineer's assistant—Lieut., U. S. Army.

DARROCH, JAMES W., senior draftsman —Ensign, U.S.S. Kennison.

HOFFMAN, J. L., senior draftsman—1st Lieut., Coast Artillery Corps, Fort Monroe, Virginia.

LAMBDIN, D. S., senior collection clerk —Naval Reserve.

GOODWIN, V. W., helper—Army Reserve Officer.

MCCAULEY, C., San Jose, mapper—Captain, Fort Ord, Calif.

MULBORN, A. W., estimator—Reserve Officer, Aberdeen Proving Ground, Maryland.

HOFFMAN, A. M., domestic lighting salesman—Army Lieut.

AMBROSE, V. H., clerk—2d Lt., QMC.

MADDEN, J. B., assistant engineer, Lt.-Col. FA, March Field.

LINGO, ALFRED A., oiler—Signal Corps Officer, Hamilton Field.

ADAMS, A. C., maintenance foreman—Lieut., 12th Naval District.

SCHUTZ, G. W., meterman—Engineering Officer, 12th Naval District.

ORR, H. L., stock clerk—1st Lieut., Fort Winfield Scott.

MCDONALD, J. L., station attendant.

MURRAY, L. K., commercial lighting salesman—Flying Cadet.

DAVIS, V. O., engineer and field clerk—Field Artillery, Training School, Fort Sill, Oklahoma.

BREMER, M. W., general foreman.

UNIVERSAL *presents* "PRECISION COOKING!"

Only UNIVERSAL offers "Precision Cooking"

BECAUSE *Only* UNIVERSAL HAS THESE 5 STAR FEATURES:

1. Mult-I-Heat Controls with Signalite Indicators.
2. Magic Eye Oven Controls.
3. Select-A-Trol.
4. Superheat Units.
5. Serv-A-Drawer.

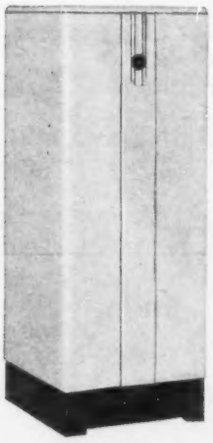
. . . the new idea in electric cookery that will boost your range sales from "simmer" to "high" in 1941!

Here, at last, is what you've been looking for—"Precision Cooking," a brand-new sales idea to increase your business in electric ranges!

What is "Precision Cooking"? Simply this: for the woman who owns a new UNIVERSAL Electric Range, cooking is quicker and easier, and results uniformly better. For each food or dish, she can select *precisely* the right heat and *precisely* the right length of time. The result is more delicious meals prepared in less time and with less work than ever before—*and at lower current costs.* And remember—*only* UNIVERSAL offers "Precision Cooking" because *only* UNIVERSAL has all the features that make it possible!

Look into the sales possibilities of UNIVERSAL "Precision Cooking" today. Wire or write for complete information. Learn how this new sales idea can help you increase your range business in 1941. And bear this in mind: "Precision Cooking" will be . . .

New for '41!



The UNIVERSAL Water Heater

UNIVERSAL now offers a brand-new electric water heater in the modern square design. Fully automatic, and as dependable as it is good-looking. Write or wire today for full particulars!

backed by a powerful national campaign designed to bring customers to your showrooms!

ELECTRIC RANGES — **UNIVERSAL** — WATER HEATERS

THE TRADE MARK KNOWN IN EVERY HOME

LANDERS, FRARY & CLARK • New Britain, Conn.

TRADE MARK REG. U.S. PAT. OFF.

Nichrome

Made only by DRIVER-HARRIS COMPANY

Stocked for the Coast Trade at

SAN FRANCISCO
235-241 San Bruno Ave.

LOS ANGELES
449 South San Pedro St.

SEATTLE
2122 Fourth Ave.

By

ANGUS-CAMPBELL, INC.

SMOOT-HOLMAN COMPANY

Pioneers of Lighting in the West

LUMINAIRES
REFLECTORS

SMOOT-HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA
MADE IN U.S.A.

FLUORESCENTS
FLOODLIGHTS

INDUSTRIAL AND COMMERCIAL LIGHTING EQUIPMENT

HOME OFFICE AND FACTORY . . . INGLEWOOD, CALIFORNIA

WAREHOUSES
SAN FRANCISCO
33 Dore Street
HOUSTON, TEXAS
315 Crawford Street

FRED ZAUGG
630 N.W. 10th Ave.,
Portland, Ore.
COAST SALES CO.
307 Main St.,
Seattle, Wash.

STEVENS SALES CO.
41 Post Office Place,
Salt Lake City, Utah
G. S. SPANGLER
618 Colorado Bldg.,
Denver, Colo.

When YOU Read the Ads—

You make your job easier to handle for you are better able to solve the problems of expanding facilities and narrowing profit margins.

You make yourself more valuable to your company because you are familiar with new and improved production equipment.

You are able to advance more rapidly through being able to apply new knowledge to your job.

You can earn more by making your job yield more to your company.

Read the Ads in Electrical West

VAN DE KAMP, WM., mapper—Naval Reserve.
EVELAND, G. H., engineer's helper—Signal Corps Officer.
DAY, H. C., supervisor dealer, sales promotion—Captain, Hq. NCA.
KERR, W. H., district agent—Captain, Quartermaster's Dept.
LEGGETT, D., file clerk and mail boy.
BRUCE. A. W., designer—Captain, Presidio of S. F.
LAZZARI, A., senior draftsman—Armored Force School, Fort Knox, Kentucky.
FISHER, V. J., senior draftsman—Boatswain's Mate, First Class.

Pacific P & L

MARSHALL, EDWARD J., clerk — 2nd Lieut., Battery C, 218th Field Artillery, Camp Murray, Wash.
PREWITT, VANCE C., radio interference tester—Lieutenant (J.G.), District Communication Office, U.S. Naval Base, Cavite, P. I.
SUTHERLAND, JOHN A., extension engineer, Yakima—1st Lieut., Quartermaster Reserve, Fort Stevens, Ore.
STAUDACHER, MARTIN M., bookkeeper, Yakima—1st Lieut., Company H, 161st Infantry, Camp Murray, Wash.
SCRUGGS, JULIUS, messenger, Portland—1st Lieut., 501st Parachute Battalion, Fort Benning, Georgia.
NOCE, JACK, messenger, Portland—Staff Sergeant, Headquarters Company, 41st Detachment, Camp Murray, Wash.

Portland GE

ARMSTRONG, GEORGE E., clerk, customers' service dept.—2nd Lieut., Vancouver Barracks, Vancouver, Wash.
DIXON, HARLOW C., rural service representative, Aurora—2nd Lieut., 186th Infantry, Oregon National Guard, Camp Murray, Wash.
FARGO, WILBERT R., engineer clerk, valuation dept.—Captain, 218th Field Artillery, Oregon National Guard, Fort Lewis, Wash.
HOLT, EARL E., lineman, Salem line dept.—1st Lieut., Quartermaster General Office, Washington, D. C.
KEUDELL, ROBERT H., inspector, Salem line dept.—2nd Lieut., Searchlight Bat., 249th Coast Artillery, Camp Clatsop, Oregon.
PEARSON, SAMUEL J., tester, line and distribution office—Asst. Post Exchange Officer, 1st Lieut. (9th F.A.), Fort Lewis, Wash.
SHROY, RICHARD E. E., meter reader, Gresham Office—2nd Lieut., Oregon National Guard, Reg. Hq. Co. 186th Infantry, Camp Murray, Wash.
SMITH, LAWRENCE K., electrical draftsman, engineering dept.—Captain, 218th Field Artillery, Oregon National Guard, Camp Murray, Wash.
STEVANUS, ELMER G., operator, sub stations—Captain, Oregon National Guard,

Tops in Preference

—BECAUSE IT'S TOPS IN PERFORMANCE!

"It's G-E for me!"

NEWS!

About The New G-E ALL-STAR REFRIGERATOR

It's "Hats Off" to the new 1941 G-E All-Star Refrigerator at G-E Dealer Previews everywhere! Exciting new beauty, New 10-Star Storage Features including the New Butter Conditioner and New Dry Storage Drawer. No wonder Public Preference for the G-E will be even greater in 1941.

More people prefer the General Electric Refrigerator than any other make . . . . A powerful statement, backed by recent independent consumer surveys made by four national magazines among refrigerator owners and prospective buyers. Over 50% more people expressed a preference for G-E than mentioned the next leading brand!

The General Electric Thrift Unit has established the greatest performance record in America . . . . Another powerful statement backed by years and years of faithful service in millions of homes. That's the reason for the tremendous public preference for G-E. That's why G-E dealers and salesmen say "Ask Your Neighbor!" It's the best sales closer of all.

GENERAL ELECTRIC

218th Field Artillery, Hq. 1st Bn. 218th F.A., Fort Lewis, Wash.

Puget Sound P & L

BAILEY, PARK WILLIS, distribution engineer—Captain, 7th Infantry, Vancouver Barracks, Vancouver, Wash.
BARCLAY, WALTER P., senior general bookkeeper—Captain, 146th Field Artillery, Fort Lewis, Camp Murray, Wash.
BAUER, WOLFFRED, clerk—Lieut. J. G., 13th Naval District, Seattle, Wash.
EDWARDS, WARREN CLAY, auto records clerk (gen'l acctg.)—1st Lieut., 15th Infantry, Fort Lewis, Wash.
FULLER, ANDREW B., draftsman—Lieut. J. G., 13th Naval Dist., Seattle, Wash.
HUDSON, ARTHUR J., waterheater inspector—Captain 116th Q.M. Corps, Fort Lewis, Wash.
HUNT, ORLAND G., jr. res. contract salesman—1st Lieut., 146th Field Art., Fort Lewis, Wash.
NICHOLS, JEROME J., clerk (acctg. dept.)—Lieut. J. G., 13th Naval District, Seattle, Wash.
REED, JACK B., messgr.—2d Lieut., 75th Coast Artillery, Anchorage, Alaska.
VAN WICKLE, JAMES M., sr. office clerk—Captain, 161st Infantry, Fort Lewis, Camp Murray, Wash.
WILTAMUTH, RALPH H., messenger—1st Lieut., 53rd Infantry, Camp Ord, Calif.
WRIGHT, HOWARD, local manager—Lieut.-Col., Coastal Defenses, Fort Worden, Wash.
BLACK, THOMAS E., jr. engineer, 1st Lieut., Engineers, Fort Belvoir, Virginia.
KAYE, ALBERT, office clerk, 1st Lieut., Engineers, Fort Belvoir, Virginia.
ROWELL, IRVING H. voltage inspector—Captain, Coast Artillery, Fortress Monroe, Hampton Roads, Virginia.

Tacoma City Light

HAIRE, ARNOLD E., substation operator—Ensign, mine-sweeping school, Norfolk, Virginia.

Utah P & L

BALLARD, RULON J., engineer—Captain, Engineer Reserve, Ogden Supply Depot, Assistant Construction Quartermaster.
COWLES, HARPER B., commercial sales—Captain, Field Artillery, University of Utah, R.O.T.C.
HOWARTH, G. A., industrial sales—Captain, Engineer Reserve, Ogden Ordnance Depot, Assistant Construction Quartermaster.
AMOTT, L. G., statistician, rate department—Captain, Field Artillery, Fort Sill, Okla.
SILVER, RICHARD M., evaluation department—2nd Lieut., Quatermaster Res., Philadelphia, Penn.

Washington Water Power

ASTON, LOUIE C., Spokane division sales—Captain, HQ Co., 161st Infantry, Camp Murray, Wash.
KLUCKHOHN, ROBERT H., personnel department—2d Lieut., 161st Infantry, Camp Murray, Wash.
MURPHY, MATTHEW, engineering department—Captain, to command and general staff school, Fort Leavenworth.
SHERRER, FRED, electrical shop—2d Lt., Engineers' Corps, Fort Murray.

Deaths—

Dick Smith succumbs after long illness

Death came to end the lingering illness of Richard E. Smith, executive assistant, Southern California Edison Co., on Dec. 8. Known best as Dick Smith, a quiet, effective and thorough arranger of PCEA convention programs and Los Angeles Electric Club affairs, a person gifted with an unexpected flare for drama, he had been selected to be general convention chairman for next year's PCEA convention at Coronado.

Born in Merill, Wis., March 31, 1885, Dick Smith came to California with his parents as a boy. He attended Lick-Wilmerding High School in San Francisco, and began in the electrical industry as a helper in an electrical contractor's shop in San Diego. In 1915 he

DICK SMITH

started as a lighting sales engineer for Pacific Light & Power Corp., in Los Angeles, and shortly afterward was appointed sales manager of Mt. Whitney Power & Electric Co. in the San Joaquin valley. He was in Tulare when that company was merged with Southern California Edison Co. in 1917.

In 1919 he was transferred to the Edison general office in Los Angeles and in 1922 made advertising manager.

A new position, that of executive assistant, was created for him in 1932, so that he could lend his talents of expression and human relations to the management officers. This position gave him the opportunity also to participate, always modestly in the background, in the employee information and public relations programs of the PCEA.

Active in the Los Angeles Electric Club, he was its president in 1923-24; and of the Rotary Club in 1938-39. His influence, however, could hardly be measured in terms of positions held or things belonged to. If a skit were to be written, a program arranged, or some unusual service performed, he was given the task and performed it with whimsical humor and understanding.

For ELECTRICAL WEST he had often written, indeed was numbered among Electra's Husbands, in fact was an originator of that now regular page, which shall miss his contributions. He will be missed everywhere.

Charles Higson, distribution superintendent, dies

Charles Roy Higson, 57, who rose from a substation operator to superintendent of distribution for the Utah Power & Light system during his 28 years with the company, died December 18 at his home in Salt Lake City. Mr. Higson, since January, 1940, had been consulting engineer, having given up his superintendency because of poor health.

After his graduation from the University of Wisconsin, he was employed by G-E at Schenectady. Two years later he became an instructor of electrical engineering at the University of Wisconsin. He joined Utah P & L in 1912.

● ORVILLE JOHNSON, for 22 years with Graybar Electric Co., in its San Francisco and coast valleys districts, and finally as lamp and lighting department manager, San Francisco, died Dec. 5, 1940, after a prolonged illness. Active in electrical industry affairs as well as fraternal organizations, his passing was mourned by a large circle of friends.

● GEORGE ROSS RANDALL, prominent electrical contractor-engineer of Salt Lake City, died November 25 of a heart ailment. Mr. Randall, at the time of his death, was manager of the Salt Lake Electric Co., which he founded in 1910. One of the founders and organizers of the Electrical League of Utah in 1919, he served as president in 1926.

● FRANK COOLEY, for some years Silvray representative in Southern California, died Nov. 9, 1940.

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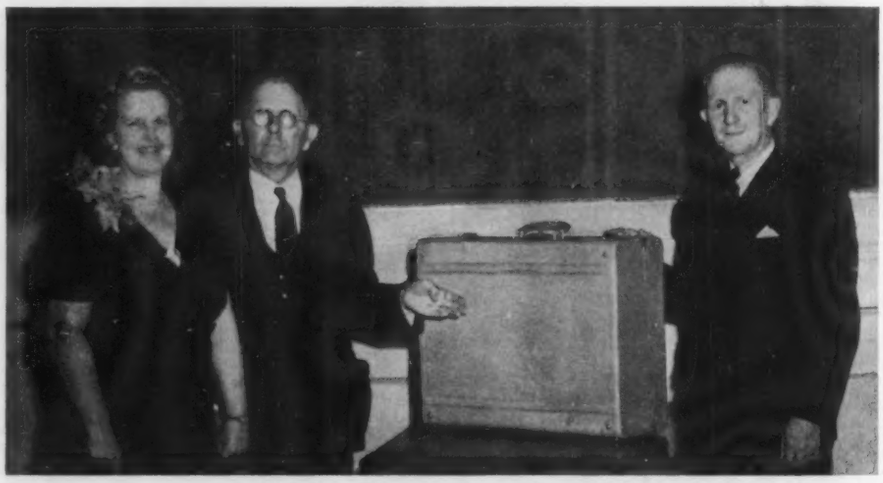
PROFILES *of the month*

New president of the Institute of Radio Engineers is (right) Prof. F. E. Terman, of Stanford. At left is Major E. H. Armstrong, of Columbia, noted for frequency modulation work



After Clifford Bartlett's promotion to manager of PG and E's North Bay Division, he was honored with a dinner, given a travelling bag. At left is Mrs. Bartlett, at center, L. J. Peterson

All active in the PCEA public relations activities are (left to right) Stanley Scarfe, G-E, Los Angeles; R. R. Walbridge, Southern California Edison, and E. A. Long, Pacific Gas and Electric Co.

Thumbs up!

WHEN the British were evacuating bombed and flaming Dunkirk, their indomitable spirit, courage and determination were eloquently expressed in a simple, defiant gesture, "thumbs up!" We in America, facing the year ahead with justifiable apprehension, may well adopt this salute and attack our problems of production and supply in the same "thumbs up" spirit. Let us dedicate this year to work. Let us realize that a healthy, active trade with its attendant increases in production and national income is the very foundation of a successful defense effort. And let all who manage or labor in manufacturing plants remember that democracy may *yet* be won or lost on the American assembly line. Whoever we are, let us enter this New Year determined that, with all our resources, and with the examples of Europe before us, our production shall be neither too little nor too late; determined that somehow, regardless of sacrifices, civilization *shall* be kept afloat—and right side up!

1941

P·G·and E·

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The electrical industry needs more outlets, too—outlets for electrical appliances in hundreds of thousands of homes. The convenience of time and labor-saving electrical servants is of little value to people whose homes are not equipped to use them properly. Homes **must** have adequate wiring, with plenty of convenience outlets, before maximum sales of electrical appliances will become possible. Make it your business to promote adequate wiring for both old and new homes in your community in 1941, and your business will prosper accordingly.

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